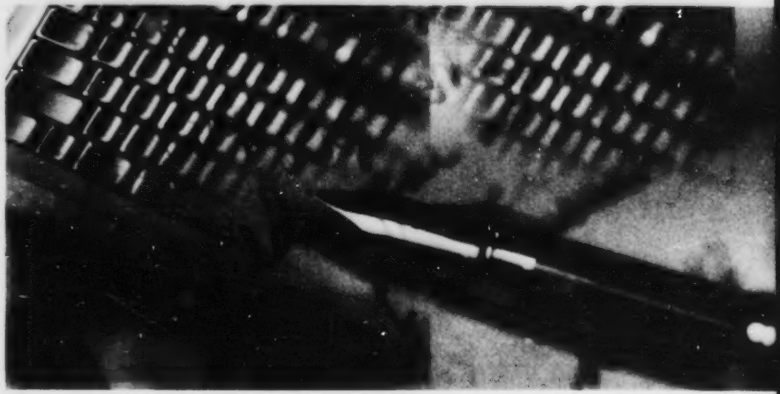
# RESEARCH REPORT

## ADAPTING CANADIAN HOUSING TECHNOLOGY TO INTERNATIONAL MARKETS



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# Adapting Canadian Housing Technology to International Markets:

## DESIGN, MATERIALS, COMPONENTS AND STRUCTURES

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March 31, 1999

# ADAPTING CANADIAN HOUSING TO EXPORT MARKETS:
## DESIGN, TECHNOLOGIES, SYSTEMS AND MATERIALS

A Study for Canada's Housing Exporters

by

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March, 1999

This project was carried out with the assistance of a financial contribution from Canada Mortgage and Housing Corporation under the terms of the External Research Program. The views expressed are those of the authors and do not represent the official views of CMHC.

# ABSTRACT

Hundreds of Canadian companies and investors are operating in international housing markets and looking actively for additional opportunities. To succeed, they pay attention to differences from Canadian norms in national and local standards, cultural traditions, design and quality expectations. This report answers three main questions: do buyers in foreign housing markets *accept what Canadian firms have "off the shelf"* at present?; how are Canadian exporters *already adapting* to specific requirements of foreign customers?; what opportunities exist to *increase market share* by adapting housing-related products, technologies and services?

Many Canadian housing-related materials, products, and whole houses *already enjoy widespread acceptance* in many foreign markets. Experienced housing exporters are *already committed to and acting on the idea of adapting what they sell* in foreign markets. They alter design, colour, finishing, quality, performance, dimensions, language of literature or other features, in some cases substantially. Some focus on products, technologies and services *specifically suited to international markets alone*, mainly for "low-cost" housing. In future, foreign private sector partners and government research institutes are likely to become partners in "co-evolving" a version of Canadian housing technology to meet their own circumstances and needs.
The report concludes with "adaptation checklists" based on experience of current exporters. These take the user through an element-by-element review of potential adaptation requirements and considerations. Also provided are contact information to reach experts in the field and references for additional reading.

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## ACKNOWLEDGEMENTS

This report on how to adapt Canadian housing to export markets engaged the interest and contributions of companies and experts from all facets of the housing export industry, and from across Canada. Some 90 owners, managers and consultants to industry were involved, whether through a mail survey (53), round table sessions (24) or individual interviews (13). We would like to express deep appreciation to everyone, mainly senior executives, who took time from their busy schedules to contribute in a variety of ways to the research underlying this study. Their views have shaped the results of this report from the very beginning.

Three people from Canadian industry associations commented on the initial design of this project, setting it on the right track: John Kenward, CEO of the Canadian Home Builders' Association (CHBA); Cliff Youdale, Executive Vice President of the Canadian Manufactured Housing Institute (CMHI), and Don Johnson, Senior Director, Technology and Policy, at CHBA. Rob Duncan, from Canada Mortgage and Housing Corporation's (CMHC) Research Division, was project manager for this study. He was very positive and helpful both at initial design stages, and in subsequent development of this report. He also provided the innovation checklist set out in Chapter 12.

Quite a number of companies or organizations provided illustrative materials and detailed technical information on their building systems and products. They included: AAB Building Systems (Ontario); Alaska Craftsman Home Program, Inc. (Alaska, U.S.A.); Atlantic Canada Home (Nova Scotia); Construct Québec (Québec); Ed Campbell Homes (British Columbia); Dow & Duggan Log Homes International (Nova Scotia); Ferguson Simek Clark (Northwest Territories); Fibrehouse Limited (Ontario); Light Steel Technologies (Ontario); Loewen Windows (Manitoba); Maple Homes Canada (British Columbia); MASCON Limited (Ontario); Modulex (Québec); Nascor Incorporated (Alberta); Nelson Homes (Alberta); Newton Homes (Manitoba); Nika Canada Limited (Ontario); NuFab Homes (Saskatchewan); Pan-Brick Okamoto Canada Ltd. (Ontario); Royal Plastics (Ontario); Scotian Homes (Nova Scotia); Systèmes Digigraph Inc. (Québec); and Viceroy Homes Limited (Ontario).

In addition, a number of people provided interesting and valuable insights through telephone interviews, face-to-face discussions, and in focus group sessions held in Vancouver and Halifax. Those involved include: Dr. Norman Cook, Canadian International Development Agency; John Daniels, Light Steel Technologies; Oliver Drerup, CMHC; Stefan Grossmann-Hensel, Architect; Jason Grant-Henley, Urban Keios Design; Judith Johnston-Ueda, MU Design Inc.; Arnie Katz, Advanced Energy Corporation; Bill Malone, Mascon Engineering Limited; Brian Marshall, REIC Consultants; Herbert Otto, Otto Bryden Erskine Martel Architects; Chong Park, Park Sanders Adam Vikse Architects Ltd.; George Reinecke, Reinecke and Associates Limited; and Pierre Paul Turgeon, CMHC.

The Vancouver focus group sessions were conducted in conjunction with CMHC management and staff from the Canadian Housing Export Centre (CHEC), and linked with consultations on CHEC forward business planning. Representing exporters of housing systems and value-added products present were: Jack D. Bibby, Principal, J.D. Bibby Management Limited (consultant to International Hi-Tech Industries Limited); Brad Grindler, President, Maple Homes Canada; Gerald Hamilton, Principal, Gerald Hamilton Architect Inc. (consultant to International Hi-Tech Industries Inc.; Dave Hiebert, General Sales Manager, B.C. and Asia Pacific, Loewen Windows; Bill Kerkhoff, President, Canadian Homes; Rick McClymont, President, Britco Factory Built Buildings; Roger A. Rached, President and CEO, International Hi-Tech Industries Limited; and Ouzi Zaccai, Vice President - International Sales, Merit Kitchens.

A separate session was also held with those involved in exporting architectural and design services, from the British Columbia-based Export Council of Canadian Architecture. Taking part in this session were: Michael Carter, Director, Japan Trade Branch, British Columbia Ministry of Employment and Investment; Martine Desbois, Strategic Industries Branch, British Columbia Ministry of Employment and Investment; David R. Galpin, Partner, Downs Archambault & Partners Architects/Planners; David Graham, Pacific Span Consultants Inc.; Keith S. Hemphill, Principal, Rositch Hemphill & Associates; Kimi Ito, Principal, K. Ito & Associates; Elia Sterling, Theodore D. Sterling & Associates Environmental Consultants; and Lubor Trubka, Lubor Trubka Associates Architects.

Focus group sessions, also focused on CHEC forward planning, were conducted in Halifax, Nova Scotia along the same lines. Exporters present included: Bob Bona, President, Scotian Homes; Derek Collier, Principal, Heritage Stairways; Paul Deveau, Vice President, Sales and Marketing, Kohler Windows; Stephen Dow, Principal, Dow & Duggan Log Homes International; Don Grant, Principal, Canadian Wood Homes; John Greenough, President, Provident Developments; Robert Williams, Vice President and General Manager, Interhab Limited; and Wayne Welsh, General Manager, Precision Floor and Roof Truss.

We would like to thank CHEC regional management and staff, notably Charles MacArthur of the Atlantic Canada Region, and Lino Siracusa and Laura Diakiw of the British Columbia and Yukon Region. They made comments on adapting housing technologies themselves and also permitted some key issues of adaptation to be raised during their consultation sessions with industry.

Lisa Van Buren prepared several case studies used in this report, and also followed up with survey respondents, drafted sections of the report, and collected company information. Cynthia Taha developed the graphs on survey results and on Canadian housing export trends, with support from David Routliffe.

William Semple of Inscape Design prepared the annotated bibliography, and also a report on the INTERBUILD trade show in Calgary, Alberta which provided additional raw materials on current adaptation efforts.

Carol Crenna researched and wrote the case study on Vancouver architect Kingsley Lo, with his cooperation.

Any errors or omissions in the text remain the responsibility of the principal author alone.

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## EXECUTIVE SUMMARY

Canada has one of the most diverse and successful housing industries in the world. Operating from this solid base, hundreds of companies with housing-related products, technologies and systems to offer are operating in foreign markets. Many are looking actively for additional export and investment opportunities abroad. To succeed, they pay attention to differences from Canadian norms in national and local standards, cultural traditions, design and quality expectations.

This report answers three main questions: do buyers in foreign housing markets *accept what Canadian firms have "off the shelf"* at present?; how are Canadian exporters *already adapting* to specific requirements of foreign customers?; and what *future opportunities* exist to increase market share by adapting housing-related products, technologies and services?

Based on Statistics Canada export data, many Canadian housing-related materials and products *already enjoy widespread acceptance* in many foreign markets. Exporters assure buyers of the quality of goods through a variety of means, and also compete effectively on price, availability, and timeliness of delivery. Nevertheless, significant opportunities remain to expand market share through adaptation to local taste, conditions and standards.

Experienced housing exporters are *already strongly committed to and acting on the idea of adapting what they sell* in foreign markets. They alter design, colour, finishing, quality, performance, dimensions, language of literature or other features, in some cases substantially. However, more needs to be done to facilitate exchanges of practical information on this topic among current and prospective exporters, resulting in significant gains in Canadian export success. Against Canada's very able competitors in international housing markets, every marketing tool that can be created for Canadian firms is needed. Advantages to be gained over other *Canadian* firms by clutching best practices in many foreign markets are fleeting, if they exist at all. While there are obviously some proprietary technologies and products and commercial-confidential "tricks of the trade", most product and service adaptations are readily evident from published company literature. The potential market is often so vast that there is plenty of room for everyone from Canada, despite possible perceptions to the contrary.

Foreign private sector partners and government research institutes are increasingly likely to become partners in "co-evolving" a version of Canadian housing technology to meet their own circumstances and needs in future. However, this approach to adaptation must be approached with care, so as to avoid difficulties caused in Japan, for example, where Canada is more noted as a source of quality, competitively-priced lumber, than as a supplier of quality whole-house systems.

Certain Canadian companies focus on products, technologies and services *specifically suited to international markets alone*, mainly for "low-cost" housing. With a few exceptions, the latter appear to be having only modest success at present. The most productive avenue for the future may lie in the direction of investing in *local ventures and technology transfer* rather than exports as such.

The report concludes with handy lists of key questions for potential use by Canadian companies exploring entry into new international markets or seeking to increase market share. These take the user through an issue-by-issue or element-by-element review of potential adaptation requirements and considerations.

The report also contains contact information for experts in the field, and references for additional reading.

## Sommaire exécutif

L'industrie canadienne du logement est l'une des plus diversifiée et des plus rentables du monde. Des centaines de sociétés au fondement solide offrent sur les marchés étrangers leurs produits, technologies et systèmes liés au domaine du bâtiment. Plusieurs recherchent activement les possibilités d'exportation et d'investissement à l'étranger. Afin de réussir, elles doivent porter une attention particulière aux normes nationales et locales en vigueur à l'extérieur du Canada, aux traditions culturelles, à la conception et aux attentes en matière de qualité.

Les acheteurs des marchés étrangers acceptent-ils les produits qu'offrent présentement les sociétés canadiennes? Comment les exportateurs canadiens s'adaptent-ils aux besoins précis des consommateurs étrangers et comment pourrait-on augmenter les parts du marché en adaptant les produits, technologies et services liés à l'industrie du logement? Voilà les trois principales questions auxquelles répond le présent rapport.

Selon les données sur l'exportation recueillies par Statistiques Canada, bon nombre de produits et de matériaux liés à l'industrie du logement sont déjà très populaires sur les marchés étrangers. Les exportateurs ont recours à différents moyens pour assurer les acheteurs de la qualité des biens et offrent des produits concurrentiels, tant au niveau des prix et de la disponibilité que des délais de livraison. Néanmoins, il y a encore de nombreux moyens d'accroître les parts du marché par une meilleure adaptation des produits aux conditions, normes et goûts locaux.

Les grands exportateurs se sont engagés à adapter leurs produits aux goûts des marchés étrangers et prennent déjà les mesures qui s'imposent. Ils modifient, parfois de façon marquée, la conception, les couleurs, la finition, la qualité, le rendement, les dimensions, la langue des documents de référence et d'autres caractéristiques de leurs produits. Il est toutefois important d'améliorer le partage de renseignements pratiques sur ce sujet entre les exportateurs existants et éventuels, afin d'accroître les exportations canadiennes. Les sociétés canadiennes doivent pouvoir disposer des meilleurs outils de marketing afin de demeurer concurrentiels sur le marché international du logement. Les possibilités d'arracher des parts de marché aux autres sociétés canadiennes en adoptant les meilleures pratiques en vigueur sur les marchés étrangers sont presque nulles. Même s'il existe des techniques et des produits privatifs et des trucs du métier secrets, la plupart des produits et des adaptations de services sont présentées dans les documents des sociétés. Même si certains croient le contraire, le marché éventuel est souvent si vaste qu'il peut faire de la place à tous les entrepreneurs canadiens.

Les partenaires étrangers du secteur privé et les instituts de recherche gouvernementaux devront collaborer pour mettre au point une technologie canadienne du logement permettant de répondre à l'avenir à leurs propres besoins. Il faut toutefois être prudent afin d'éviter les situations comme celle qui se produit au Japon, où le Canada est reconnu comme une source de bon bois d'oeuvre bon marché plutôt que comme un fournisseur de systèmes complets de logement de qualité.

Certaines sociétés canadiennes mettent l'accent sur les produits, les technologies et les services destinés uniquement aux marchés internationaux, particulièrement dans le secteur du logement à prix modique. À quelques exceptions près, ces sociétés semblent ne connaître jusqu'à maintenant

qu'un modeste succès. Les secteurs d'avenir prometteurs sont ceux des opérations locales et du transfert de technologie, plutôt que celui de l'exportation proprement dite.

Une liste de questions clés à l'intention des sociétés canadiennes qui cherchent à percer le marché international ou qui visent à augmenter leur part de marché, figurent à la fin du rapport. Elle permettra à l'utilisateur de passer en revue chaque point ou chaque élément à adapter.

Le rapport contient aussi des renseignements sur les spécialistes du domaine, ainsi que des références utiles.

# 1. WHY ADAPT?: CANADA'S GROWING HOUSING EXPORTS[1]

## 1.1 Purpose of This Report

This report is among the first of its kind. It documents what Canadian companies and public-private partnerships are already doing to adapt to foreign markets. It offers a portfolio of case studies showing precisely how and why adaptation is occurring in a variety of priority markets and often under dramatically different circumstances. It suggests to exporters some key lessons learned and practical guidelines for the future.

Much of the available Canadian literature on how to adapt housing to different consumer and regulatory requirements is focused on the *domestic* market. Reports address northern climatic conditions, Aboriginal lifestyles and needs, and the needs of the elderly and of the disabled. Most previous Canadian studies carried out on foreign market differences address mainly *low-cost housing*. A notable example is the work of the McGill University "Minimum Cost Housing Group", located in the School of Architecture, on systems for both India and China, to be described further in Chapter 11.

## 1.2 Relevance of the Topic

According to a variety of indicators, Canada has one of the most diverse and successful housing industries in the world. Operating from this solid base, hundreds of Canadian companies with housing-related materials, components and systems to offer are operating in foreign markets. Many are looking actively for additional export and investment opportunities abroad.

All parts of Canada's housing production system have a lot of experience, expertise, and skills to bring to the world. They include: home builders, developers, and investors; housing system manufacturers; building materials producers; manufacturers of construction machinery and equipment and tools; consolidators; trading house operators; and wholesalers. They are supported in their efforts by providers of such housing-related services as planning, consulting engineering, architecture, and training.

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[1] Some portions of this Chapter and of Chapter 2 have been updated and adapted from work previously undertaken for the Canada Mortgage and Housing Corporation in 1996 on *Canada's Housing Export Experience and Prospects*.

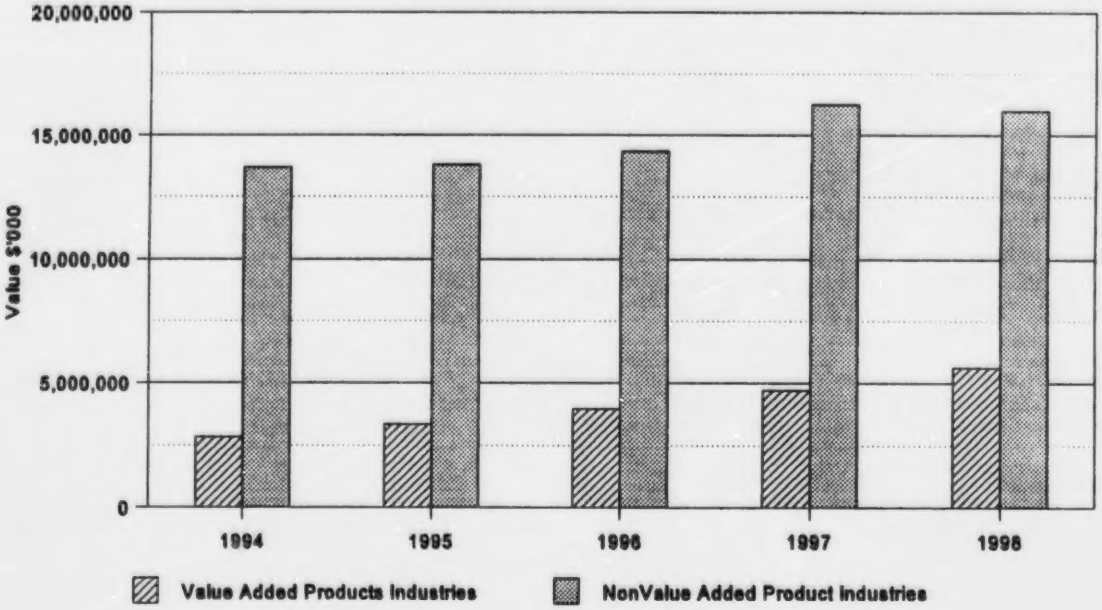
Housing cuts across many different industrial sectors in Canada, drawing all of them along on the basis of a complete "Canadian housing system". This includes: financing, design, and quality control methods; structural elements; electrical and mechanical systems; insulation and cladding; finishing; and household equipment. Canadian firms may also offer training, project management, financing and other services associated with their products, building even further on the concept of an *integrated housing system*.

## 1.3 Trends in Housing Exports

The need to study Canadian exporter responses to those who can afford to pay for imported housing appears more pressing than before, given the increasing volume and diversity of housing exports.

"Housing-related" exports increased by approximately 7 percent annually in real terms, based just on trends from 1993-97 in sales of products usually associated with residential construction. While overall exports declined in 1998, they remained substantial, and the shift in the "mix" of materials, components and systems sold was encouraging.

**COMPARING VALUE-ADDED AND NONVALUE-ADDED HOUSING-RELATED EXPORTS (1994 TO 1998)**



Source: Statistics Canada, Exports by Commodity, December, 1998

Applying *Canadian* patterns of end use derived from Statistics Canada input-output data to these figures, exports used only for housing in foreign countries may have formed about 82 percent of these amounts, or about $18 billion in 1998.[2] From reports of individual companies and sub-sectors, exports of Canadian housing-related *services and investment in ventures abroad* have also been growing rapidly, though they were likely much smaller in absolute dollar value.

### 1.4 Key International Markets

The United States remains Canada's largest market for softwood lumber with over 76 percent of the total. Developed countries such as Japan, Australia and the United Kingdom are also significant markets, reflecting both the lack of domestic timber and increasing use of wood-frame technology there.

While Canadian firms are still heavily dependent on the United States for large-volume exports, they are tending to venture farther and farther afield. Such companies are making inroads in several new foreign markets for Canada's wood-frame construction techniques, such as Poland, South Korea, and Chile. The pattern of moving from commodity exports to higher value-added shipments including complete housing systems is already well underway there.

In any examination of how housing design, technology, materials and services need to be adapted to foreign markets, wood products will play a vital role. Indeed, the most extensive Canadian adaptation activities at present appear to revolve around modifications to Canadian wood-frame housing to meet consumer needs in other countries.

Figures for the past few years also reveal solid growth in international shipments of

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[2] No data series explicitly called "housing exports" are available from Statistics Canada. A picture of "housing-related" exports can be built up product by product from detailed data on *all* construction commodity, component, machinery and equipment exports. When a set of statistics on all such products is ready, it then is possible to estimate what may be going into housing compared with other types of construction using input-output data. For example, similar lighting fixtures may go into homes, offices, factories, or universities. However, we know from input-output figures that approximately 38.5 percent of all electrical and electronic items go to residential uses. Hence this proportion is applied to all components of this type. Similar proportions exist for all major types of housing inputs, ranging up to 90.2 percent for wood products. To arrive at the overall figures on housing product exports used throughout this report, export data in the following categories were assembled: plastics products, such as pipes and polyethylene; textile products, such as carpets; wood-based products, including lumber, particle board, doors and windows; paper products, including tar and wallpaper; fabricated metal products, including doors, hardware, and heating equipment; machinery, including sawmills and bulldozers; electrical and electronic products, such as appliances, lamps, and thermostats; non-metallic mineral products, such as cement, brick and bathroom sinks; chemical products, such as paint and varnish; prefabricated buildings. To place an outer limit on the range of products considered within the term "housing exports", anything which typically *remains in a home* when it is sold in Canada is included. Items such as furniture and tools, which usually move with the occupant, are *not counted.*

Figures for the past few years also reveal solid growth in international shipments of many other standard commodities, such as building bricks, owing to high Canadian quality, a lower Canadian dollar, and the reliability and timeliness of Canadian suppliers.

Exporters assure buyers of the quality of goods through a variety of means. These include:

- ISO 9000 certification of their company itself;
- Canadian Construction Materials Centre (CCMC), Canadian Standards Association (CSA) and/or Underwriters Laboratories Canada (ULC) certification of their product;
- demonstration in use of Canadian materials, components and systems in the climate and under the normal operating conditions of the host country.

Nevertheless, as the chart in Section 1.3 above illustrates, international sales have been ramping up among building materials and components involving higher added value and high-technology manufacturing. Examples have included: combined refrigerator-freezers, furnaces, fluorescent lamps, plastic windows and doors, and planing machines for wood.

As well, the role played by wood products within total construction-related exports has been falling, from almost 81 percent in 1993, to 75.7 percent in 1997. Within wood product exports, dimensioned softwood lumber appears to have reached a plateau, while exports of particle board, windows, plywood, and builders' joinery have been rising rapidly in the recent past.

Canadian exporters know that there is much to be gained by moving along within wood products toward those with greater value added, such as kitchen cabinets and prefabricated homes. In markets where a lot of dimensioned lumber is being sold, additional Canadian products, systems and services often appear to "tag along". That is, importers of Canadian softwood lumber may also become interested in vapour barriers, insulation, sheathing, brick ties, vinyl siding, truss-plates, PVC plumbing, heating and ventilation technologies, design advice, training, joint-venture partners, and so on.

This pattern of export development shows up in data marking an increasingly diverse mix of Canadian building products destined for use in housing. It also poses major challenges, however, in maintaining international quality control systems for 2x4 construction.

Simply expanding the range of materials shipped risks the complete loss of ability to shape what continues to be known as "Canadian" housing as these products penetrate foreign markets. It may also lead to Canada becoming known simply as a "low-cost supplier" of commodities such as lumber, which are then incorporated into traditional building methods, and yield no further gains among higher value-added products and services.

Customers in established Canadian markets such as Germany are recognizing the advantages of wood-frame technology in building affordable housing. They are broadening the scope of imports from Canada to include a growing proportion of high value-added products, purchased to meet pressing new needs. As *Canada's Action Plan for Japan* indicates, local market factors in the receiving country can have a strong influence in moving buyers up the "value-added chain" toward products and systems which involve greater Canadian design, labour and profits.

In Japan's case, it is a projected decline in the numbers of construction workers by 45 percent by the year 2000. This is driving the Japanese housing industry to use more labour-saving components. In Germany's case, it is the need to provide more spacious and better quality housing for people of the "neue laender" of the former German Democratic Republic, bringing them up to the standards enjoyed in the West.

In addition to frame technologies -- including steel-frame systems -- for lower density housing, Canadian technologies for masonry and medium-high rise buildings are among the most advanced in the world. These provide a basis for expanding international markets too. Just one example is a system for collecting solar energy on the walls of masonry or panel buildings which can be applied in new or retrofit situations.

Sales are taking off in this and other fields where Canadian innovations such as the "healthy house" are being introduced to foreign markets.[3] Providing site services to individual dwellings and to whole residential communities at reasonable economic and environmental cost is becoming of equal or greater concern as housing construction itself.

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[3] The "Healthy House" developed in prototype form by Canada Mortgage and Housing Corporation seeks both to improve occupant health through careful attention to materials and components used, and also to reduce dependency on community services through "autonomous" energy, water, heating and sanitation systems.

## 1.6 Marketing A Comprehensive "Canadian Housing System"

In the past, housing construction around the world has typically been an almost entirely local activity, based on local economic conditions, and using immediately available construction capabilities, materials and technologies. It has only been in the last decade, even in North America, that vast superstores with products from many different countries have emerged, and that residential development has become a serious prospect for global operations.

To take full advantage of the opportunities available for Canadian housing exports, it is essential to build on the success of the current range of housing-related exports as part of the "Canadian housing system". Marketing housing-related exports as a system can open doors for the full range of other items not currently exported, or not exported to particular markets.

Experts in international housing trends indicate that, in many cases, emerging export market opportunities in countries such as China, Korea, and South Africa are limited by time and circumstances. They reflect a burden on local capacities while there is "catch up" with the demands of industrial development, and a return to mainly local supply of housing. In other words, there is a "window of opportunity" for Canadian exports which may close in the future.

The volume of demand may be very high for a decade or two until a country's own capacities fully assimilate the demand. The numbers involved are several orders of magnitude larger than the entire Canadian new construction market, as a few examples from studies undertaken over the past few years serve to illustrate:

- over 2,000,000 units of public housing needed annually in China;
- an estimated 11,000,000-unit backlog in Russia;
- an estimated 1,400,000-unit backlog in South Africa;
- an estimated 6,100,000-unit backlog in Mexico;
- an estimated 3,000,000-unit backlog in Argentina.

## 1.7 The Potential Role of Adaptation in International Marketing

By working pro-actively to adapt their housing designs, technologies, materials and services to foreign markets, Canadian firms may be able to achieve multiple goals at once:

- show sensitivity to cultural, practical and social norms in the receiving country, increasing the likelihood of long-term acceptance side by side with domestic firms;

- reenforce the perception that Canadians are good people to do business with and have the best interests of their customers at heart as well as their own;

- secure an entrée into the process of quality control so that the reputation of Canadian goods and services is not damaged through "quick-buck" tactics on the part of either Canadian suppliers of local builders;

- build toward a shared process of market research and innovation within the host countries, leading to longer-term benefits for Canadian consumers as well as foreign buyers, and the Canadian suppliers themselves.

## 2. INHERENT ADVANTAGES OF THE CANADIAN HOUSING SYSTEM

### 2.1 What is "the Canadian Housing System"?

According to many indicators, such as the presence of running water, sanitary facilities, central heating, and adequate space per person, Canadians are among the best-housed people in the world. This is the proud achievement of the Canadian housing industry, working in partnership with three levels of government, the voluntary and co-operative sectors. Important work remains to be done to bring everyone in the country to a basic standard -- especially among Canada's Aboriginal people -- but this is well within the capacity of the Canadian housing industry to supply.

While many factors contribute to Canadian housing quality, comfort and affordability, one is surely the dominance of "light-building" construction methods. These take inherently less materials that do alternative methods, are faster to erect, easier to renovate, and more energy efficient. Highly competitive markets exist across North America for all types of materials, components and services to support wood-frame and steel-frame technologies for creating low-rise buildings, and poured-in-place concrete for high-rise construction with steel-frame interior and curtain walls.

Canadian applied housing research and the development of new light-building technologies such and the R-2000 and "Advanced" houses also provide designers and builders of housing in the private sector with tools to produce environmentally responsible, energy efficient and healthful homes.

Strange as it may seem to many Canadians, *frame is a minority technology* in much of the rest of the world outside Canada and the United States, except for Scandinavia, for a combination of historical and other reasons. Yet Canadian frame and flying-form high-rise concrete construction methods are frequently shown to be superior to local construction techniques and end-products used elsewhere. In addition, the "Canadian housing system" is very diverse, with panelized and modular building methods, polymer shells, log homes, and pre-engineered homes all finding significant market niches in competition with frame-based systems.

### 2.2 Advantages of Innovative Canadian Construction Methods[4]

Over 60 million frame dwellings probably exist in North America today, having been built all over the continent since the beginning of the 20th century. Frame construction is quite different from both solid wood and masonry construction.

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[4] Ideas for this section were provided by Oliver Drerup of CMHC's Canadian Housing Export Centre.

While its positive features may be recognized in principle, in practice there are many vested interests supporting traditional methods of building in other countries, including both materials suppliers and building trades. The promoters of Canadian frame systems need to address both public perceptions, e.g., that it burns easily, and the building codes and standards in which these are embedded, to make headway.

Advantages of frame construction include:

- It is usually less costly per square metre to build than most other methods.
- New dwellings can be completed in 1-3 months.
- It is highly flexible as to exterior and interior design, and materials used to clad the outside of the house.
- It is very energy efficient, because hollow walls can be filled with insulation of high quality.
- Environmentally responsible, recyclable materials are used most efficiently in this type of construction, which also produces much reusable material if it is correctly demolished or "deconstructed".
- Homes are able to use highly-efficient forced-air heating for reduced greenhouse gas and other emissions.

Frame housing technology, whether in manufactured modular and pre-engineered or entirely site-built forms, is gaining acceptance in countries where traditional construction techniques are proving inadequate and costly.

Based on R-2000 building and quality control methods, the Canadian system for energy efficient housing is recognized by such perceptive international buyers as the Japanese, as being the most advanced and best-proven option available. Visitors to Canada are known to comment very favourably on what they see here.

Many individual technologies, products and services which form part of the frame system are also readily adaptable to needs of other countries. These can be "mixed and matched" with local building forms and methods. For example, frame partitions can be added during the renovation of a solid masonry building, and Canadian ground-source heat pumps may be combined with local home heating systems.

Canadian manufactured housing captures the strength of innovations in wood-frame methods and adds to them a variety of other techniques, ranging from specialized modular systems to log housing kits which capture the full beauty of wood.

## 2.3 Other Canadian Competitive and Comparative Advantages

Beyond its advantages in frame technology, Canadian methods of producing higher density buildings in concrete, with steel interior framing and a masonry veneer are also appealing to more countries. They are fast to erect, flexible, strong, and easier to renovate than many panel construction systems.

Through the C-2000 program and other means, Canadian companies are also becoming world leaders in developing this type of construction and adapting it to the needs of the 21st century.

Beyond the basic and advanced technologies used, Canada has many other competitive and comparative advantages in world markets for housing, upon which Canadian companies can base their strategies.

These include:

- efficient, and comparatively low-cost manufacturing processes for high value-added goods;
- an efficient international transportation system for getting products to market;
- comparatively large reserves of natural resources for making building materials;
- well-capitalized and stable financial institutions to support export endeavours and investments;
- a well-established and rigorous regulatory regime to support quality control engendered by the market, as exemplified in the National Building Code;
- a world-wide reputation for quality products and for honest and fair business practices.

## 2.4 Building on Current Advantages[5]

There is a limited time horizon for many of the international housing opportunities described above. Canada's major competitors are becoming increasingly active and ready to seize the same opportunities. In addition to commenting on the high quality of products usually offered, buyers in other countries also report that Canadian companies may show up for trade show exhibits and then disappear again.

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[5] Ideas for this section were provided by Dr. Sol Silverman, a long-time consultant to the Canadian housing industry.

In some markets, Canadians have an image, rightly or wrongly, as lacking in the persistence needed to sell themselves and to form appropriate commercial linkages in new markets.

Moreover, Dutch, Austrian, Finnish, and Turkish financial institutions are known for their rapid entry into new international markets and their close co-operative links with exporters of construction products and services. Canadian banks and other financial institutions appear to lag behind in the crucial area of project financing.

While Canadian building and development firms have been rather bold at entering the U.S. residential marketplace, they have had mixed success in doing so. Canadian materials suppliers are already well established there. Other countries may appear more challenging, but may in fact, present a more welcoming climate for Canadian housing technologies. As one experienced housing systems exporter says, "We have nothing to tell them in the United States." Important niche markets and regional markets remain there, but they are highly competitive.

The great adaptability of frame low-rise and flying-form high-rise building systems is one of the major selling points Canadian companies have in entering and increasing share of international housing sales and sound investment prospects. The truth is that Canadian building methods can mimic local buildings, work with themes from traditional housing in modern forms, or contrast markedly from it, all as the customer desires.

# 3. MEETING THE CHALLENGE OF ADAPTATION

## 3.1 Introduction

Given the kinds of factors just discussed, this study started with three major assumptions about the challenge of adapting Canadian housing technology to foreign markets, and in particular to those beyond the United States:

- The North American market must breed inertia, because most Canadian suppliers have a large continental demand for what they already produce with little if any further adaptation.

- Much of the rest of the world is oriented to solid masonry, post-and-beam and traditional methods, or to indigenous materials such as adobe and thatch, and therefore has a bias against frame technology as applied in North America.

- There is nevertheless some overseas market for visibly "North American" housing that Canadian companies already offer, so adaptation is not really needed in many cases.

In brief, the starting position in undertaking this study was that adaptation might be a good idea in principle and technically feasible, but would face large obstacles in practice. The original idea was to begin to interest Canadian exporters in strategic adaptation, with the aim that they might eventually put it into practice.

The research results from extensive contacts with the exporters painted quite a different picture:

- A majority of building materials producers may indeed be exporting much the same products as they sell in the domestic market. However, manufacturers of whole housing systems and of many value-added products have already proceeded well down the path to adaptation. They say they are fully committed to it. Even lumber suppliers have made quite a number of product adaptations for export markets.

- While the bias against frame technology in much of the world undeniably exists, it appears to be melting away under the combined pressures of local market demand and increased effort at penetration by frame proponents. Particularly in eastern Germany, Japan, and Chile, there is a new openness to the demonstrated advantages of frame, based on adaptations to specific regulatory and consumer requirements. Nevertheless, one supplier of frame systems suggested that a builder putting up a frame project in [Eastern] Germany should erect a high wall around the whole project while it is under construction and then take it down when the units are finished.

- A significant market for visibly "Western-style" housing exists in many parts of the world, generally among the newly wealthy portion of the population. Even in this case, however, specific adaptations are still helpful in marketing, as well as in ensuring that housing fits in with local site services, climate and other constraints. Even in Canada itself, immigrants may ask architects and builders to make modifications or express demands for housing adapted to their tastes according to their country of origin.

## 3.2 Active Exporters Are Committed to Adaptation

In May and June of 1998, The Bayswater Consulting Group, Inc. did a survey of active housing exporters based in Canada.[6] According to this, over 90 percent believe it to be "very important" or "somewhat important" to adapt what they sell to foreign markets, making it different from what they would sell in the domestic Canadian market.

Experienced exporters consider consumer expectations, tastes, regulatory requirements and other factors differing from those typical in this country. Fully 94 percent of firms polled are already making adaptations of various kinds to market what they export more successfully. Nearly the same proportion are planning to continue to adapt in the future.

In brief, the practice of adapting design, colour, finishing, quality, performance, dimensions, language or other features of Canadian housing products, systems and services to foreign markets is already widespread among experienced exporters. More remains to be done to facilitate exchanges of practical information on this topic among current and potential exporters, since gains in both market share and export success for all Canadian companies could result.

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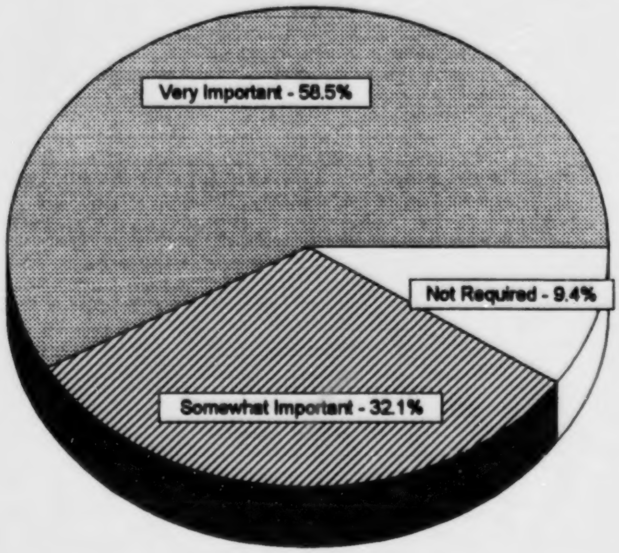
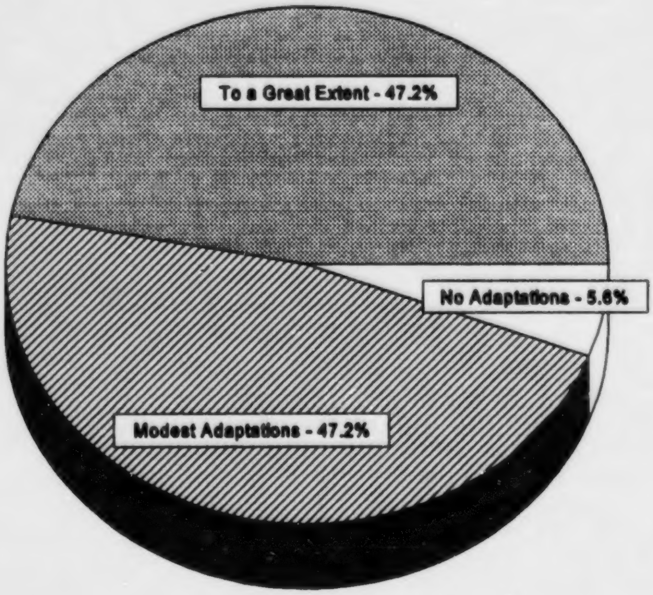
[6] The survey form in English or French was mailed to a sample of 218 firms active in exporting to international markets. These were selected from among export-ready companies found in the following sources: "Canadian Company Capabilities" database of the Department of Industry; WINEXPORTS database of the Department of Foreign Affairs and International Trade; Bayswater's own company mailing lists compiled for Canada Mortgage and Housing Corporation and other clients; *Membership and Product Directory of the Canadian Window and Door Manufacturers Association*; directory of exporting members of the Canadian Manufactured Housing Institute; *Canadian Value Added Building Products Export Directory*; *International Directory of Canadian Building Products and Services*; *Construction Export Directory* of the Canadian Construction Association; participants in recent building industry trade shows in Montreal, Toronto and Calgary. See Annex "C" for complete details on survey results and methods used. The 53 returns from industry are probably biased in the direction of those with the greatest interest and level of activity in this field, and also indicate a bias in favour of Asian markets compared to patterns of Canadian housing exports as a whole. These biases do not undercut the value of the results: the aim in choosing the sample was to find out what the *most active* exporters are doing, and to concentrate attention on *offshore* markets where requirements for adaptation are likely to be greater.

## IMPORTANCE TO COMPANIES OF ADAPTING TO FOREIGN MARKET EXPECTATIONS



Source: Survey by The Bayswater Consulting Group Inc.

## EXTENT THAT COMPANIES ALREADY ADAPT TO FOREIGN MARKET REQUIREMENTS

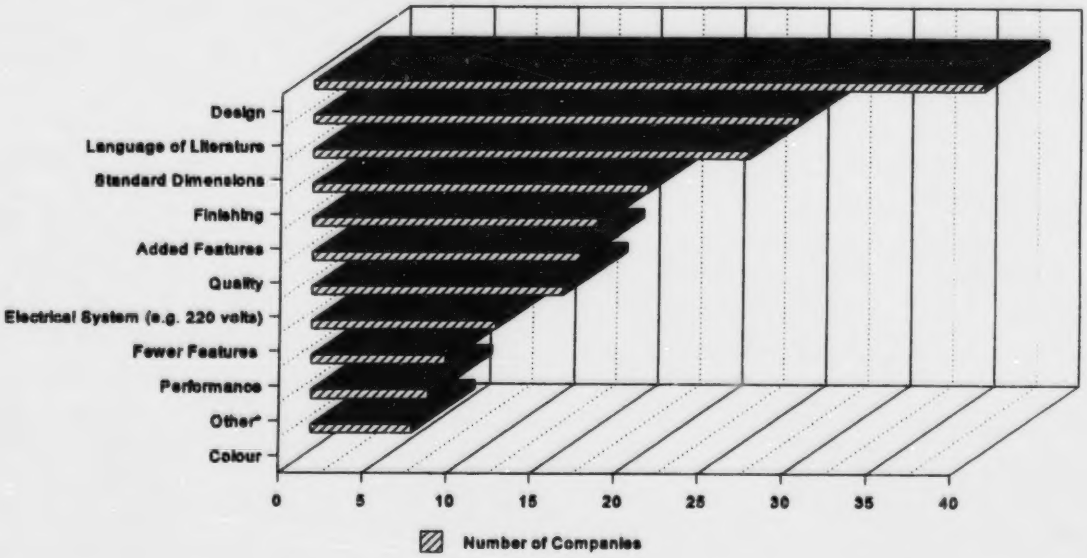


Source: Survey by The Bayswater Consulting Group Inc.

### 3.3 Planning For Market Adaptation

It is clear from the survey returns and from direct discussions with them that experienced exporters consider a careful market analysis in advance to be an essential first step to success.

**MOST COMMON PRODUCT ADAPTATIONS**



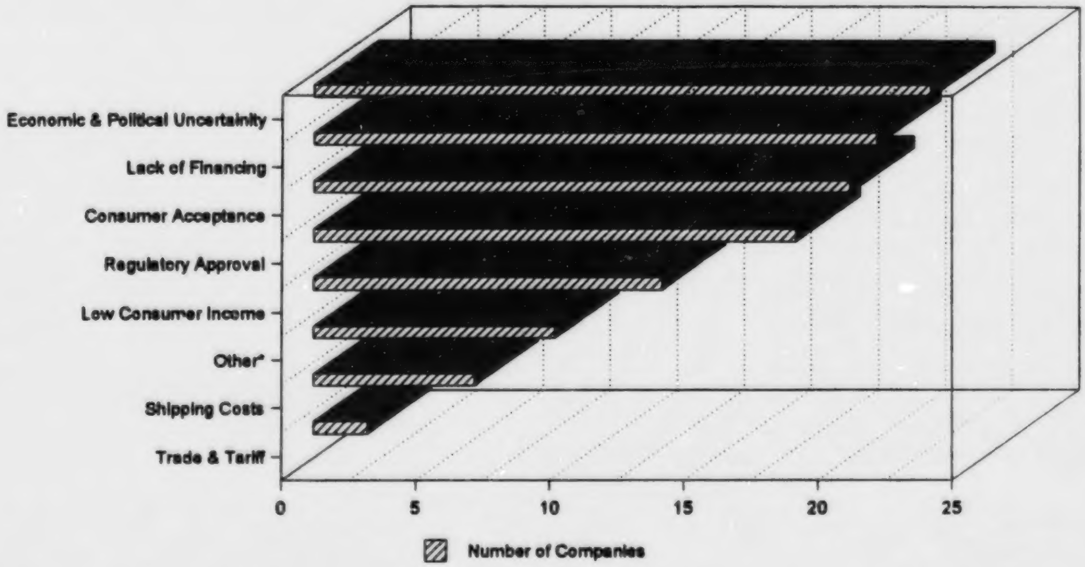
Other: Includes Floor plans, Standard sizes, Language of product itself (design software)

Source: Survey by The Bayswater Consulting Group Inc.

According to one corporate executive: "The impetus for adapting our products is to meet market demands, standards, and price thresholds. The approach is to work with companies operating in the specific area of interest. This assures compliance with foreign requirements, i.e., we respond to their locally-based expertise." Another concurred: "We undertake extensive research into our clients' needs and preferences. From the results, we have designed our products to meet the clients' need directly. We also spent sufficient time to develop a clear and effective understanding and a good relationship." A Canadian firm active in Germany remarks: "You have to be sure to keep updated all the time. If the market goes down here, then you need to rely on other markets. We are trying to use new designs and a lot of variety. Being flexible is important."

Commenting on the issue of whether "adaptation" is the right term, other exporters noted: "It's not so much a matter of adapting but rather of marketing and working with clients to figure out what they need." "Rather than trying to adapt a product for export, it is better to design a specific product exclusively for export. That is what other countries such as Japan and Taiwan are doing successfully." "The importance of adapting depends on to whom you are marketing. Make sure you have Canadian style if they want it, or Japanese style." Another firm added: "House designs tend to be different from country to country, so we certainly tailor our designs when demanded. However, in many cases, it is the Canadian design that attracts them! In all our communication, we try our best to converse in their language."

**MAIN BARRIERS COMPANIES CURRENTLY FACE IN ENTERING OVERSEAS MARKETS**



**Other:** Includes Competition from other countries, Low prices, Undervaluation of good design by Canadian exporters, Lack of good business partners, Becoming known in foreign markets, and Not applicable

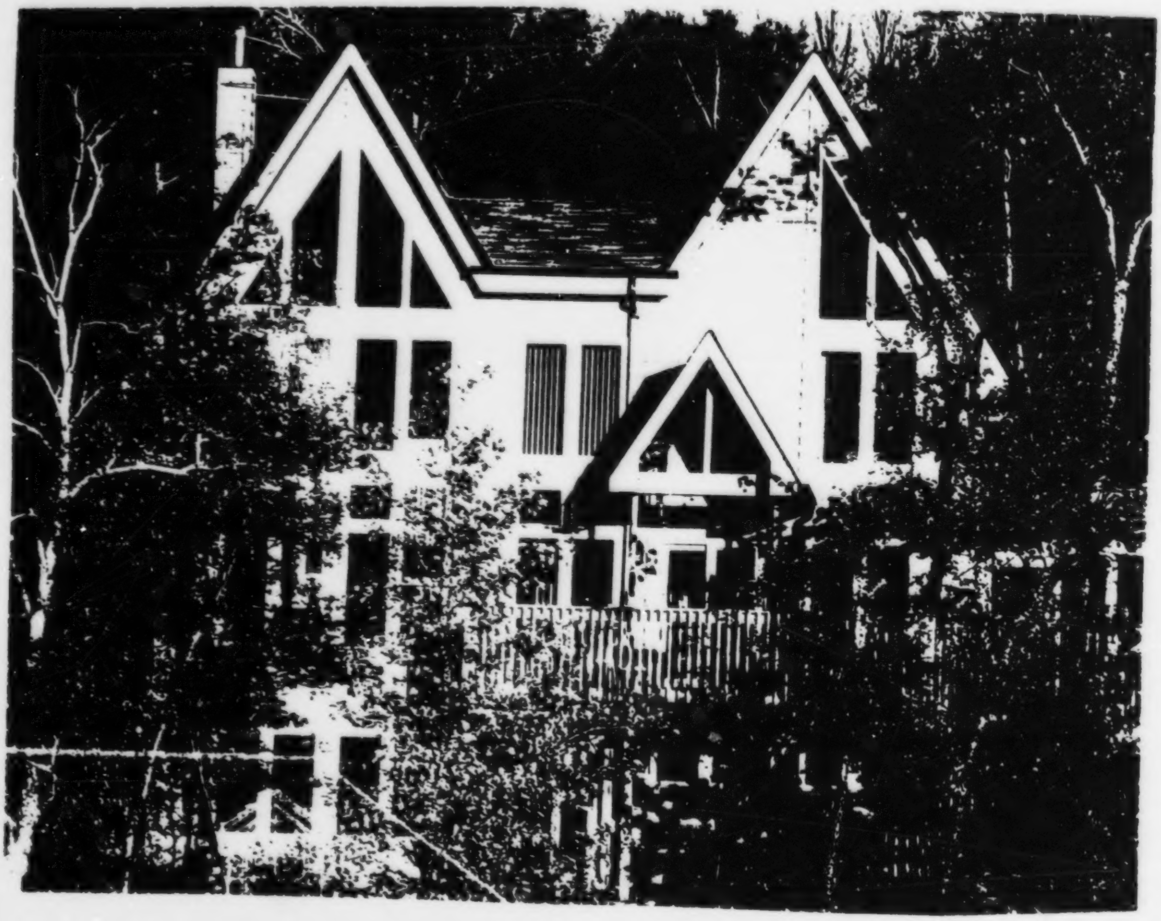
**Source:** Survey by The Bayswater Consulting Group Inc.

In addition, a respondent noted the importance of acquiring first-hand knowledge of the market: "We visit countries wanting our service." A respondent commented: "Basically, [we] adapt Canadian wood-frame to suit a country's culture." Another respondent said "It's necessary to adapt to customer needs, particularly when retaining a Canadian design."

country has its unique norms. If you don't conform then you're too different. If you can be flexible, you are much better off, in Europe and Asia particularly.
The bottom line, according to one respondent, is that "Canadian companies must strive to always make it easier for a customer to do business with us rather than our competitors world-wide."

Another exporters argues: "The product is not the problem. The commercial assistance received from government and industry agencies is the main problem. We need commercial assistance targeted to our specific needs, such as `Strategis', BOTs and BOCs etc. The government should be offering `background' information, knowing that we need personal assistance."

## EXAMPLES OF DIFFERENT DESIGNS USED IN DIFFERENT MARKETS



German Design (Courtesy Viceroy Homes)

## 3.4 Specific Types of Adaptations

Turning to more specific aspects of adaptation, respondents noted the following:

Design:

- "We are architects. Our designs must meet local codes while still remaining `Canadian' using Canadian materials."
- "As technical and architecture consultants, our work is based on adaptation for both standards requirements and design."
- "Design and standard dimensions are adapted to the metric system. We work with their design requirements and customer preferences for style and room sizing."
- "We try to accommodate clients and build according to what they want. In Japan, standards for staircases are steeper. Space considerations are different. Furniture is scaled down in size."
- "Our product is designed specifically for the Japanese market."
- "Each country has its unique norms. If you don't conform then you're too different. If you can be flexible, you are much better off in Europe and Asia particularly."
- "We offer houses according to measure. The client supplies the plans and specifications and we take this information into account in the construction."
- "Customers basically want Canadian-style homes. We do make changes to the architectural design based on clients requests."
- "Our product is created with a calculated design, using the traditional [vernacular] of each country (to the extent possible). We develop our technology to fit the design standards of different countries."
- "Houses are designed for Asian living, including fire protection based on small lot size."
- "Floor plans are customized to suit ethnic designs."
- "We use the same floor plans in the U.S. There are only slight modifications for electrical and plumbing and for building codes. Adaptations are based on customer preferences."

- "Changes are made based on customer preference. For example, a bomb shelter was installed in Israeli house, a foyer excluded from a house in Japan, and a separate kitchen built in Chile."

- "Adaptations include narrower lots in design, a second floor balcony, fireproof materials where required, more detailed instructions, and extra materials."

- "Designs come from different countries. We adapt to match windows and doors to the customer's mentality. For example, the usage of rooms may be different, with no family room, and no closets."

- "We offer exterior and interior finishes to suit the local market."

- "Energy efficiency in our target markets is not a great concern to the consumer. Therefore, our product line has been re-engineered to reflect durability and price, with less vinyl, less glass, while maintaining structural integrity. Our literature has been translated into languages appropriate to our target markets."

- "We have to adapt to accommodate the market. We must compromise to what they need. We can build to Canadian standards, but they may not need the entire two car garage with three bedrooms because they have different standards."

- "We custom manufacture units for various climates."

Materials and Component Specifications:

- "We adapt our components to the metric system. We have had to compromise on quality in order to meet pricing demands. What Canadians use for standard construction lumber is of low quality generally. In Japan, we use either J grade or appearance lumber. Lower quality is sometimes acceptable, but we try to hand pick it ourselves."

- "Our kitchens are modified to lower counter top height and cabinets protected against insects. Windows are made to withstand moisture penetration from storms."

- "Ventilation devices in Canada often reside in unfinished basements". By contrast, "In ... Asia, houses are small. Therefore all rooms are finished. Our product, heat recovery ventilators, must be pleasing to see in a finished room after being installed."

- "We use a high line of dimension lumber not normally used domestically."
- "There is an expectation of high quality building products."
- "Products are produced to different size specifications. Colours are made to match customer preferences. Different installation systems are used.
- "Window sizes are adapted to foreign markets. Energy performance is upgraded to low-E [glass]."
- "The consumer environment varies and housing is different in various parts of the world. For example, in Japan they suggest that they want wooden frame windows. PVC is considered cheap plastic."
- "Adapted according style, appearance, based on customer preference. For example, European windows that tilt and turn."
- "Adaptations include: machining door jambs to accept sound insulating plastic and foam profile; drilling a door middle rail for wiring; producing some literature in foreign languages."
- "Design and accommodation for services in foreign countries are major considerations (e.g. pre-drilling for electrical services, etc.)
- "[We offer] limited adaptations because we are after the affordable housing market. We provide different styles of windows, square or arched depending on local taste. In Sri Lanka, for example we make windows with grills."
- "We aim at government housing projects. If we aim at consumers, they generally cannot afford our products."
- "Most material is usually to the customers expectations. It's important to be very flexible in custom design and also in what they want to receive (i.e. complete or without certain parts). Price according to what is shipped. For example, we may not send a roof if a customer asks."

On-Site Management and Labour:

- "Although most places use English, we find its very important in Germany to have language capabilities. Speak to them in German and get specifications from the clients."

- "We offer quality-minded `Canadian' tradespeople to build their home, adapting to their specific requirements."
- "The rest of the world would love to have our systems, consumers that is. It withstands earthquakes better. But local acceptance by tradespeople is a barrier, not consumers, [but] people such as builders and building inspectors."
- "A great deal of education is needed for trades people in other countries. Even with good pricing, if they don't understand the system (2x4 frame platform) then it takes longer and costs more. It takes the Japanese builders 3 times as long sometimes to put a house together."

Product Literature:

- "Literature is translated."
- "It's indispensable to use the local language in promotional materials. It also helps to improve the product's visibility."
- "In terms of material publications, we translate them into the language of the people."

## 3.5 Does Adaptation Add to or Subtract From the Bottom Line?

While more than 80 active exporters taking part in either a survey or focus group sessions tend to be optimistic about the value and returns of adaptation, different segments of the housing export industry have contrasting views on whether it is feasible and viable to make such an effort. As one exporter notes:

> "Every company has to examine the issue of adapting its product to better meet the needs of foreign markets. However, this may not be congruent with domestic sales and production/manufacturing feasibility. In other words, is the production process then compatible for domestic sales? Goals of a company may not be to sell exclusively outside Canada. Therefore it must balance foreign needs with domestic needs and/or differing needs of various countries."

The key factor in resolving this dilemma is the volume of demand. One exporter states simply: "We have designed and introduced products based on market demand or requirements." Another concurs: "Generally, we require some volume production in order for a product to be redesigned. Forecasting this volume can be difficult, however."

A third states: "It is important to assess potential market share for your product and the cost/benefit of adapting to markets. Assess the cost/benefit of foreign representation, or a foreign subsidiary." A fourth notes: "Careful materials selection to ensure price comparability is important."

From a different vantage point, a company executive comments: "The problems I encounter in Latin America right now are the terms of payment."

Some see no particular conflict or extra costs of adaptation because of their basic company strategy: "Whether we build for export or domestic markets, we produce totally custom homes. As all of homes are custom handcrafted, we adapt all of our projects to each individual client." "It is natural that all aspects of commercial, technical, design and other perspectives should be completely based on the country of sale, rather than the country of manufacture." "To summarize, adaptation is very important to any company wanting to export their products and/or services to different countries." "Typically, we will communicate with the client on each project and adapt accordingly as there are different requirements for each project."

At the same time, there are complaints about pricing and quality assurance practices of some exporters: "Too many North American-based manufacturing companies look at the export market as a dumping ground, particularly Eastern Europe. This drives down prices and lowers expectations of product quality. The result is low-priced, low-quality local manufacturers taking over markets on the basis of the freight factor."

Another firm, engaged in providing design services notes: "Design is undervalued both domestically and overseas. Much of what is exported is very poor design. If we (Canada) continue to export poor design quality, we will lose our market to those that export good design. We also need to look at exporting a complete housing system with a warranty behind it, not just bits and pieces."

### 3.6 Different Case Studies of Adaptation

Adapting housing design, technologies, and materials is an activity of creative individuals, like architects, industrial designers and engineers, working hand in glove with corporate managers. Thus in the case studies in Chapters 4 to 11, there is a focus on the activities of specific individuals who help to make the adaptations happen. They are not alone in doing what they did: the nature of the professions involved is to learn a great deal from each other, whether through direct contacts, or the literature, etc. The risks of selecting specific individuals appeared to be far outweighed by the increased interest in specifics of a given adaptation story.

# 4. THE UNITED STATES: ADAPTING IN A FAMILIAR MARKET

## 4.1 The Opportunity

As the largest advanced industrial country in the world, with over 120 million households, the United States market commands attention above and beyond its strategic role as a military superpower and global investor. As a rule, it is a fairly safe to multiply most Canadian numbers by ten to estimate the approximate American value, whether looking into numbers of metropolitan areas, annual dwelling starts, value of construction put in place, employment in the industry, etc. However, Gross Domestic Product per capita in Canada is about three quarters of that in the United States.

As in Canada, volumes of new residential construction in America have been fairly stable in recent years -- at around 1.4 million annually -- and are giving way to much more investment in home renovation. New construction is concentrated in the South, Southwest and West, which also receive much of the internal migration and substantial immigration.

Important regional differences in U.S. rates of economic development will be reflected in volumes of housing imports and opportunities for residential development in the next ten years.

## 4.2 The Dominant Technology[7]

Canadian and American home-building technology are similar, except that in the South and Southwest, climatic differences permit lighter building methods with less insulation and more attention to cooling and ventilation. American housing technology has gone through a number of major shifts paralleling those in Canada, and is now focused on home-based offices, home security, energy efficiency, and environmental conservation, all of which are important Canadian areas of strength. The pace of technological change is affected by the large number of small contractors, who are generally more conservative about many types of innovation.

Housing in the United States is very much a fashion statement and status symbol, so design, comfort and attractiveness of the "look" are all very important. Especially in Texas and California, Spanish influence in building design is substantial. There are also distinct regional vernacular architectural styles in New England, the South, and the Northwest. The Midwest is influenced by a variety of styles from across the country.

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[7] Portions of this section were adapted from *Housing Export Opportunity Series: United States* (Ottawa: Canada Mortgage and Housing Corporation, 1997.)

Manufactured housing, as defined in the United States, is essentially what Canadians call "mobile homes". It offers smaller, less expensive dwellings and is generally a more developed market in the United States than in Canada.

U.S. manufactured homes, unlike site-built homes, are subject to a single national building code. The other types of manufactured homes, such as luxury modular homes, customized housing and log home kits, are still covered under the different state codes.

Building codes differ by region because of climate. For example, the coastal regions in Florida and California generally apply more stringent structural and wind-shear codes for wood-home construction than do other regions. In all, there are three major building code systems, although an effort to bring them together in a single "International Building Code" is now underway.

Canadian companies tend to focus their export efforts on U.S. border states, where the climate is similar and serving the market is less costly. Products designed for cold weather climates are "overbuilt" compared to those being marketed in regions where climate is more moderate.

In some cases (e.g. softwood lumber), the source of supply defines the product flow. The path of least resistance means that U.S. border states account for the heaviest consumption of Canadian housing-related products. However, regions experiencing rapid growth and where housing activity has been strong (e.g., Georgia, Florida and Texas) provide an additional demand impetus, which partially offsets the constraints of physical distance.

Consumer preferences can also affect product flows, especially when product design and fashion are integral features. Products, such as kitchen cabinets, carpets, drapes and lighting, fall into this category. For these interior decor products, certain markets tend to favour contemporary design (New York and California), while others favour more traditional styling (Boston and Minneapolis). To a lesser extent, consumer preferences also play a role in commodity-oriented products such as wood. For example, wood pine is a preferred species for certain applications in the southern United States.

Canadian exporters of value-added products tend to occupy niche segments, where specialized features and capabilities provide added-value to distributors and their customers. Many exporters feel it is important to have something unique or different to offer U.S. customers. By offering a degree of exclusivity to American distributors, Canadian exporters are often able to enhance the perception of value.

## 4.3 The Challenge of Adaptation

Typical American households are even more mobile than Canadian households and move more frequently than once every five years. The substantial American military establishment also calls for many households to be on the move at regular intervals.

The main stories of the past few decades have been the outward flight of population from cities to suburbs and to "ex-urban" communities, the shift from the Eastern Seaboard and Midwest to the Far West and South, and the immigration of a large Hispanic and Vietnamese population to Northeastern and California cities.

Race relations and the politics of racial integration and segregation have had a major influence on housing and related development, and form a constant subtext of American social policy debate. Nevertheless, many of the worrisome trends in American cities of the 1970s and 80s have proven to be less extreme in their results than originally feared. Substantial investment in many city cores has occurred, and crime rates are declining in most urban areas as the population ages. There remain strong concerns about personal safety and the continuing violence and decline of many inner city areas.

A challenge for Canadian producers is to adapt their products to suit regional conditions. The American climate is more varied than that in Canada. It ranges from conditions very similar to those on the Canadian prairies, in Southern Ontario and Quebec, in Atlantic Canada, and on the Canadian West Coast in states such as the Dakotas, Michigan and New York, Maine, and Washington respectively, to subtropical and semi-tropical climates in the Carolinas and Florida, and desert in Arizona, Nevada and New Mexico.

Impacts of the natural environment on housing are generally more severe than Canada in relation to earthquakes, tornadoes, and hurricanes, and less severe in relation to cold and blizzards. As one moves south from the border, it is wise to be prepared for more concern about the risks of natural disasters than is generally the case in Canada.

Canadian products compete well with their American counterparts mainly on price. In several niches and in border regions, Canadian items can also compete on quality and on timeliness of delivery. Canadian cold weather home-building technology is most relevant to Alaska and the Northern tier of the continental United States, where it faces competition from cheaper, less energy-efficient conventional building methods.

Canadian building-related services normally accompany the formation of subsidiaries, corporate acquisitions and investment by Canadian companies, and a few Canadian-owned builders rank within the top 100 in the U.S. Otherwise, such services are not likely to be able to compete successfully from Canada. Except for niche markets like software support, and healthy house services, competition from established local firms is likely to be stiff.

Many larger Canadian materials manufacturers are subsidiaries of U.S.-based companies, so investment and technology transfer flows have traditionally been northward. However, increasing numbers of Canadian-owned companies are also investing in production in the United States, notably in relation to doors, polymer building systems, and furnaces. In each of these cases, Canadian companies are competing effectively against the American counterparts. However, there is still little or no competition when it comes to placing productive investments in the United States: it is welcomed and evenly actively courted in most states across the country.

Canadian firms may be confused by the comparatively greater complexity of American municipal administration, which has been much less subject to consolidation than in Canada. There are many more special-purpose bodies, and a much more ready resort to the courts to enforce various regulations or to stop development. On the other hand, the plethora of jurisdictions and "free enterprise" spirit means that approvals may be easier to obtain in many cases.

Looking at the current experience of Canadian firms and projecting a bit into the future, some of the most interesting regional "fits" include:

- selling "smart house" and home safety or security devices nation-wide through large chains of home renovation centres, with emphasis in Eastern and Midwestern cities;
- selling energy-efficient prefabricated housing in the Pacific Mountain states, Alaska and on the Northwest Coast;
- selling apartment renovation technologies and services in the Eastern Seaboard states;
- selling "healthy house" design services, technologies and products nationally through affinity groups, such as associations of allergy sufferers, but with emphasis on California and Southern states;
- selling senior citizen housing design services, technologies and products nationally through specialty stores, beginning in New England;

- selling "green building" and "sustainable city" policy, design, and project implementation services, as well as related technologies and products, to municipal authorities in Washington, Oregon and California.

## 4.4 Meeting the Challenge: The Alaska Craftsman Home Program[8]

Alaskan housing is dominated by wood-frame systems with clapboard exteriors, many of which do not use a building envelop or have very loose air vapour barriers. Houses are plagued by air leakage and poor ventilation. As a result, some rooms may be drafty while others are always stale. Poor indoor air quality creates health risks in addition to creating an uncomfortable living environment. Windows can also fog up or get covered with interior icing. Heating systems are often inefficient, with as much as 30% to 50% of energy costs flying right out the chimney.

The Alaska Craftsman Home Program (ACHP) is the United States' version of Canada's R-2000 program. The program provided a way to improve housing standards by offering training and education in energy-efficient building technology throughout the state of Alaska. Formed in 1987, ACHP responded to a glut of poorly constructed and adapted southern United States housing erected during Alaska's building boom associated with oil development.

Alaskan builders have been obligated to take training in using vapour barriers. The program also spawned a demand for the export of Canadian technologies such as heat recovery ventilators and blower doors. Moreover, ACHP helped cement ties between Canada and Alaska by bringing about closer linkages to Canadian housing organizations and corporations.

ACHP Homes incorporate the following Canadian technological advantages. They use advanced framing techniques which reduce heat conduction by using higher levels of insulation and more efficient structural assemblies. More effective insulation with high R-values and more effective installation techniques in the ceilings, walls and floors also reduces heat transfer. Computer analysis helps determine the optimal placement and installation of the insulation materials.

All ACHP certified homes use a continuous air/vapour retarder which is installed throughout the exterior envelop. This creates a very airtight structure so that air leakage can be minimized and controlled. Controlled, mechanical ventilation is necessary in energy-efficient construction for indoor air quality, as well as to ensure the durability of the structure. Draft-free construction allows an ACHP home to reduce air leakage approximately five times in contrast to a traditional home of the same size.

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[8] This section is courtesy of information supplied directly by the ACHP and also an interview with Oliver Drerup of CMHC's Canadian Housing Export Centre, who led the Canadian team to Alaska.

8 27 '84

Alaska Craftsman home using R2000 technology (Courtesy Oliver Drerup, CMHC)

High quality windows and doors can cut heat loss to half that of standard double pane windows and can virtually eliminate interior icing and condensation in combination with proper home ventilation. A controlled ventilation system brings in fresh air, distributes it evenly throughout the home and exhausts the stale air. Further energy-efficiency is achieved through the use of energy-efficient appliances and heating equipment.

Housing in Alaska must meet the demands of very diverse climatic zones with extreme temperatures, as well as precipitation, soil, and cultural differences. Canadian technology adapted well and met these demands while providing a high standard of housing.

### 4.4 Meeting the Challenge: Canadian Standards in North Carolina[9]

The North Carolina Advanced Energy Corporation (AEC) is an independent organization established in 1980 by the N.C. Utilities commission to promote the beneficial and efficient use of electricity. Through its Applied Building Science Center, AEC helps industrial, commercial and residential customers solve problems. As part of its problem solving efforts, AEC brought in Canadian specialists to talk about and demonstrate Canadian housing standards and building techniques.

A building science specialist at AEC, Arnie Katz, notes that for the most part North Carolina is no where near Canadian standards, particularly when it comes to air tight construction. The organization is seeking to improve those standards by training local labour to "build it tight, ventilate it right and insulate it right". Canada's R-2000 standards helped influence AEC's demonstration housing to showcase exemplary housing standards.

While standards are important, a significant aspect of the organization's work is on training and quality control. Teaching technicians and builders in North Carolina and nationwide to improve their building techniques is doing more to improve housing than increasing standards, claims Katz.

Moreover, consumers in North Carolina still have little awareness or demand for energy efficient housing. Electricity is cheap, costing about seven cents a kwh; and the climate is mild. Mr. Katz asserts that energy efficiency is just "not a real big driver". However, there has been a growing response to healthy housing. Among customer concerns are mold and mildew, uncomfortable conditions, poor indoor air quality, and the durablity of houses.

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[9] This section is based on information kindly supplied by the North Carolina Advanced Energy Corporation.

AEC hopes that by emphasizing the health aspects of housing, consumers will catch on to the benefits of energy efficient houses. AEC promotes improved air quality through the use of ventilation systems. Currently, very few houses incorporate ventilation systems. Quality control is emphasized, particularly through the installation of HVAC insulation. Field research in the area reveals that about 8 out of 10 homes have leaky ducts that typically deliver only 60% of the heating and cooling produced by heat pumps and central air conditioners. Making the house more tightly sealed and energy efficient as a by product also helps consumers realize some cost savings. Katz remarks that consumers like to think of the savings as helping pay for the more expensive healthy housing features.

## 4.5 Conclusions

Canadian housing exporters have a long history of two-way exchange with the U.S. market. Frame technology evolved in both countries along fairly similar lines. In each country, there are strong market pressures to innovate and adapt to a diverse domestic clientele, which includes people from around the world. Each has wide variety, both in building technologies and in housing styles.

This report emphasizes situations in which American builders are learning about Canadian-developed adaptations to a cold climate, notably R-2000 energy-efficient housing. The wider reality is, of course, that housing technologies as well as other innovations flow rather readily across the border. South-North flows are considerably more common, especially in relation to individual building materials, products, and unit designs.

What gives Canadian housing exporters a competitive edge in the United States is their familiarity with North American housing technology coupled with their unique vantage point on the northern half of the continent. This suggests they are likely to have greater chances of success in adapting to requirements of a variety of northern markets open to innovation. It should not be surprising, therefore that so many of the target markets for Canadian exporters are temperate, northerly countries newly open to greater diversity of building methods and styles: Korea, Japan, Russia, northern China, and at the antipodes, Chile.

# 5. JAPAN: ADAPTING THROUGH ALLIANCES AND PARTNERSHIPS[10]

## 5.1 The Opportunity[11]

Japan continues to be the world's largest housing market from a foreign supplier perspective, with some 1.4 million housing starts annually, and major reliance on imported lumber, cement, steel and other materials from around the globe.

For a decade, Japan has been Canada's leading overseas market for forest products. Canada has been the source of some 80 per cent of lumber imported for Japan's burgeoning 2X4 housing sector, and a significant amount of lumber for the still-dominant post-and-beam housing market. The lumber exporting community has also taken the lead on many difficult market access issues affecting the Canadian housing system as a whole. Canadian value-added building materials have only recently been introduced to Japan. The range of products exported has remained quite limited.

Canada's market share for value-added building products and systems is still well below full potential. Acute shortages of skilled tradespeople and high domestic labour costs, combined with consumer demand for high quality, reasonably priced housing, continue to fuel requirements for imported building products and systems. There remains a largely untapped market opportunity for Canadian exporters of doors, windows, flooring, staircases, system kitchens, prefabricated wall panels and house packages (pre-engineered and manufactured).

While Canada has been Japan's largest supplier of imported prefabricated housing in recent years, this lead could be lost quite easily, as an ever-increasing number of exporters from competitor nations enter the market.

A key area of Canadian effort in Japan is the transfer of building technology to promote three-storey wooden construction as a cost-effective alternative to steel/concrete structures for both housing and multi-use facilities.

The successful conclusion of the Uruguay Round in 1994 resulted in either a phased reduction or, for some products, full elimination by 1999 of Japan's tariffs on softwood lumber, plywood, particleboard, wood mouldings, doors, windows and other building products.

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[10] The contents of this Chapter were heavily shaped by two focus group sessions with Canadian exporters to Japan held in Vancouver.

[11] Portions of this Chapter are drawn from reports prepared by the Canadian Embassy in Tokyo and made available through the DFAIT Web site.

These tariff changes will enhance further the price competitiveness of Canadian products compared with domestically manufactured components. Further, the Japanese government has developed a program to promote imports of building materials and manufactured housing actively through initiatives such as model home sites across the country.

The Kobe/Osaka region witnessed a devastating earthquake in January 1995. The strong performance of the existing Canadian 2x4 housing during the earthquake assisted Canada's efforts to promote prefabricated 2x4 housing throughout Japan. It also helped to ensure a continuing strong market demand for Canadian dimension lumber, plywood and oriented strandboard.

Canadian log home kits have also gained considerable market share among upper income households. Japanese people have preferred the beauty of natural wood as an interior finish for centuries.

There is a growing Japanese demand as well for "specialized" housing for seniors and for the disabled, with features and equipment such as easier access, wider interior doorways, lowered countertops/cupboards and special bathroom amenities, all of which Canadian manufacturers can supply very competitively.

## 5.1 Dominant Housing Technology[12]

The traditional post-and-beam housing sector, by far the largest single component of the wooden housing market, will likely remain the principal user of Canadian lumber in Japan. In the apartment sector, reinforced concrete construction will continue to account for most of the activity and will offer a huge market potential for a wide range of Canadian building products.

Traditional Japanese houses are simple one- or two-story wooden buildings with tile roofs. The floor level is above that of the entrance. Rooms are separated by sliding paper screens which allow summer breezes to flow through the house. Many Japanese apartments and houses usually have one or more rooms containing Western-style furnishing. Rural houses are traditionally wooden with one to four rooms. Metal or ceramic tile roofing is taking the place of thatched roofs on older dwellings.

Every Japanese family longs for its own single-family home, and there is a heavy preference for wooden construction. The market trend in recent years is toward Western-style design, with more open floor plans than ever seen before in Japan.

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[12] Portions of this section are based on information found in *Housing Export Opportunities Series: Japan* (Ottawa: Canada Mortgage and Housing Corporation, 1997).

However, two elements of the traditional Japanese house are being retained and seem to be inviolate: the recessed front/back entry hall and the traditional Japanese bath and bathroom layout.

Outside the major cities, as well as in two-generation households, at least one "tatami room" is often built on the ground floor of houses, either for entertaining and overnight guests, or for the live-in grandparents(s). In this room, traditional tatami mats are used for sleeping and put away during the daytime.

Regardless of taste, the sophisticated Japanese homebuyer looks for high-quality, well-designed, reliable products with good after-service and maintenance programs.

## 5.2 The Challenge of Adaptation[13]

Many Japanese spend years saving money before entering the housing market, and therefore consumers are often well-educated about what they would like. Moreover, the prospective homeowner commonly acts as building inspector. Although concerns tend to be cosmetic rather than functional, consumers are picky about what they want and pay extreme care to keeping materials clean and the site tidy.

Despite the many advantages of Canadian technology and expertise, the inherent cost-savings in 2x4 construction have failed to be realized in Japan. For a number of reasons, Japanese construction is often inefficient, adding to the ultimate cost of the home. Canadians face the entrenchment of traditional systems and the slow acceptance of new ones. Most Japanese construction details are overly conservative, partially due to standards and building code requirements and partially due to tradition. Carpenters tend to abhor physical defects such as knots, warp, wane etc., even though these materials are ultimately covered up. Just one example of this is that staircases are never built until the finishing carpentry stages so that treads do not become scuffed or dirty. Instead, work crews must climb up and down ladders between the floors in a house during initial phases of construction.

The tradition of post-and-beam construction, together with the long-standing apprenticeship program, means that working details are often determined by the carpenter/contractor on site. As most mature carpenters have no trade training in Western 2x4 construction techniques, the apprentice is learning a set of inappropriate skills, which often includes holdovers from traditional construction detailing.

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[13] This section is based on a June, 1998 study carried out for CMHC's Research Division by the Export Council for Canadian Architecture called *Canada/Japan Residential Cost Comparison Study*.

Recruiting and training construction workers, and guaranteeing quality of on-site construction in Japan is becoming increasingly difficult. Previously, the construction industry was made up of highly skilled, apprenticed carpenters who took great pride in the quality of their workmanship. However, the average age of these carpenters in Japan is rising dramatically -- as is their cost -- since young Japanese are better educated and are not attracted into manual trades. In addition, most tradesmen are trained on the job by their employer.

This means there is little uniformity in either the knowledge being imparted or the quality of instruction. The Japanese government has also never instituted a national trade training in programs such as 2x4 construction.

With the number of construction workers projected to decline substantially by the year 2000, the Japanese housing industry is being forced to introduce additional finished and/or prefabricated components. The need for proper training of the Japanese builder/partners' crews is taking on an even more vital role.

Although Canadian exporters have historically trained their partners' people, the expansion of 2x4 skills in Japan will greatly benefit aggressive exporters in the longer term. Forward-looking colleges and training schools across Canada are specializing in construction-related skills development. They are promoting the availability of training courses to take full advantage of this increasingly important aspect of full service. As well, influential Japanese organizations like JETRO (Japanese External Trade Organization) and International Housing Import Association (or IHIO) are working closely with Canadian trade representatives and Canadian exporters to ensure that training seminars in Japan are promoted extensively.

Canadian design professionals are already expert in interpreting Western style in a wide range of wood-frame housing forms including town houses, terrace housing, row housing, and three and four storey multi-family condominiums for the Japanese market. In addition, they have a mature understanding of wood-frame technology and have developed a broad wood-frame vocabulary ranging from low-cost to the luxurious.

## 5.3 Meeting the Challenge: Maple Court[14]

A three-storey wooden apartment project called "Maple Court" was completed in Osaka during 1994. Sponsored by the Osaka Prefectural Housing Supply Corporation, Maple Court contained 44 rental apartments and was constructed mostly with Canadian materials, framers and drywallers, supplemented by local labour. A Canadian architect also played a key role in the project.

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[14] This section is based on information published by the Canadian Embassy in Tokyo and made available by the Department of Foreign Affairs and International Trade (DFAIT) on its Web site.

Maple Court is being utilized to show the benefits of multi-storey wooden apartment construction and has attracted a good deal of attention across Japan because of its cost-efficiency and ease of construction. There is every reason to believe that similar three-storey apartment projects will be undertaken in Osaka, as well as other areas of Japan.

The success of Maple Court Project in Osaka led to two similar projects in Takarazuka City, Hyogo Prefecture. Built as part of that Prefecture's post-earthquake housing reconstruction plan, the Takarazuka Akura and Kirihata Projects are three-story 2x4 wooden rental apartments comprising 72 units (designed by Edmonton-based Junichi Hashimoto Architect Limited), and 180 units respectively. Canadian materials used in these projects include lumber, kitchen cabinets, windows, etc. Canadian framers and carpenters were also used in the construction of these projects.

### 5.4 Meeting the Challenge: Japan-Canada Research and Development Committee[15]

Perhaps one of the best examples of how Canadian adaptation of frame housing technology is proceeding in Japan is the Canada/Japan R-2000 Housing Committee. This is part of a wider cooperation effort reflecting both increased Canadian interest in the Japanese market and Japanese desire for more energy efficient houses.

Mutual interests led to a formal agreement on R-2000 technology in 1989. Due to worl-wide concern and an emphasis in Japan on improving indoor air quality and reducing energy consumption, Japan has turned to this uniquely Canadian technology to help address these concerns.

Teams from Canada and Japan have came together each year to present research papers and review developments in the building industry. Workshops on various housing technologies have included representatives of the housing industry, building researchers, building product suppliers, utility representatives, regulatory authorities and government officials.

Organizational and financial contributions to the workshops have come from CANMET Energy Technology Centre, the Building Research Institute of Japan, the Japan Ministry of Construction, the National Research Council, CMHC, and the Canadian Forest Service.

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[15] This section is based on reports published by Natural Resources Canada (NRCan), and on interviews with Mark Riley and Robin Sinha of NRCan.

According to Mark Riley and Robin Sinha of Natural Resources Canada, meetings between Canadians and Japanese have sought to achieve three main goals: providing a mechanism for regular information exchange between the two countries; establishing a forum for ongoing technical information exchange; identifying Research & Development projects to support R-2000 housing in both countries.

As a result of these contacts between colleagues from each country, a number of specific collaborative projects have come about that yield benefits for both countries. Collaboration has helped to address barriers to developing and adapting more affordable and energy efficient designs in both countries.

### 5.5 Meeting the Challenge: Mu Design[16]

The Canadian firm of Mu Design has a wealth of experience working in the Tokyo housing market. Judith Johnston-Ueda and Minoru Ueda provide design and construction services in traditional Japanese construction, wood-frame construction, as well as steel and concrete construction. The two work with small local builders on single-family dwellings and small apartments.

In marketing their services, Ms. Johnston-Ueda notes that 90 percent of what they sell is their expertise and their knowledge. Building a strong reputation and a personal relationship with contractors is absolutely essential to working with the Japanese. The company works one on one with its clients to custom design dwellings or often to rebuild homes.

After a glut of building in Japan during the 1990s, the economic downturn in 1997 and 1998 has left a very competitive market. Despite these difficulties, Canadian housing and housing components still offer some attractive features. The Japanese like lots of wood, according to Ms. Johnston-Ueda. They particularly like Canadian windows, cabinetry, flooring and stairs. Features such as full wall windows are also popular. Wood exteriors are prohibited, however, in the areas in which they build.

Approximately 70 percent of housing in Japan is subject to strict fire-proofing standards. Houses must be metal clad to meet these requirements. Accordingly Mu Design often uses stucco as an alternative to wood.

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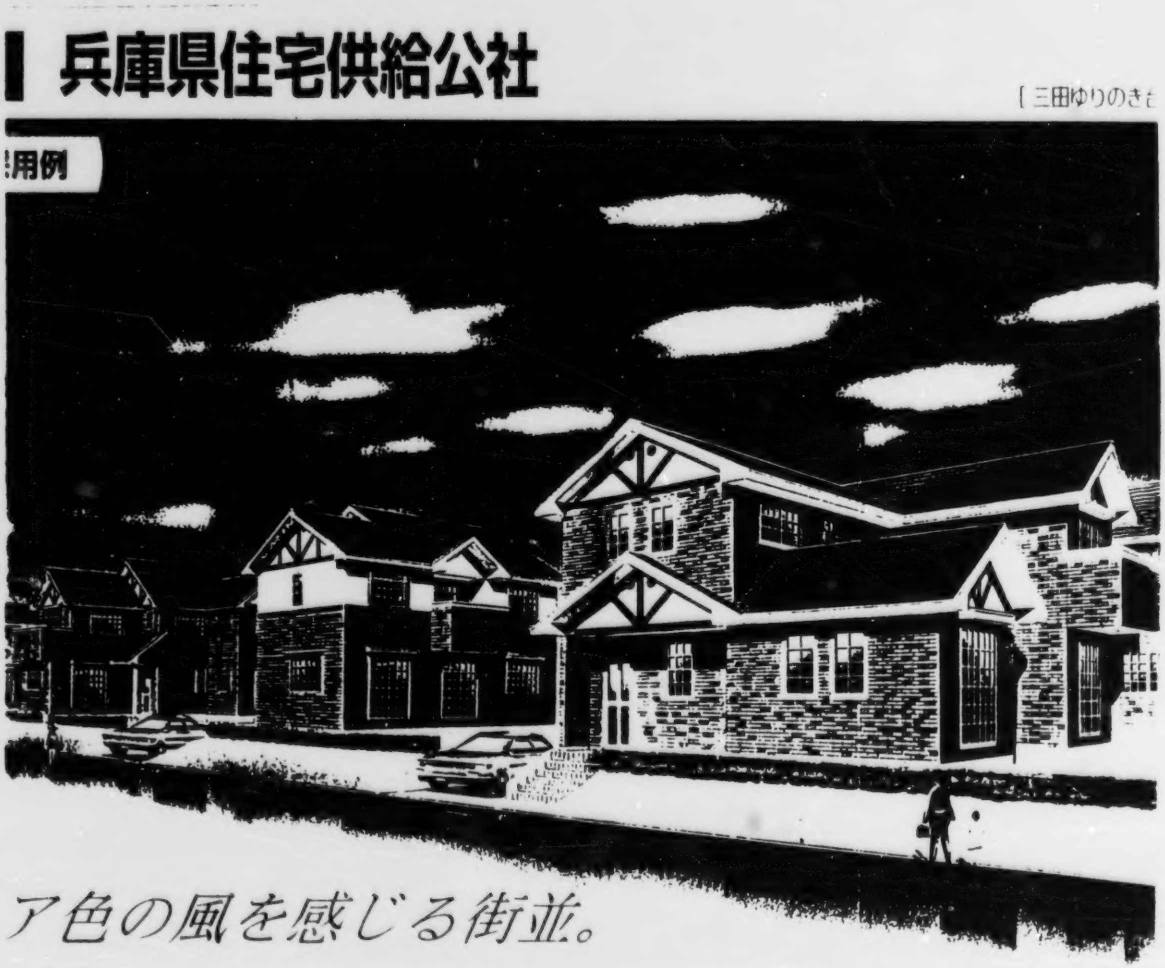
[16] This section is based on company profile information provided by Mixed use Design and on interviews with Judith Johnston-Ueda.


兵庫県住宅供給公社
［三田ゆりのき
用例
ア色の風を感じる街並。

Japanese housing development using Canadian technology (Courtesy Okamoto Canada Limited)

## 5.6 Meeting the Challenge: DAC International and Healthy Housing[17]

Another small Canadian firm, DAC International maintains a busy schedule in the Japanese housing market. DAC manufactures housing and acts as a supplier to builders in Japan providing a spectrum of building materials. In addition, the company is helping co-author a book on healthy housing for the Japanese market.

President of DAC Jeff Armstrong finds it critical to respect local housing preferences. He is working with Japanese customers who specifically want North American types of housing. The houses have some adaptations to the Japanese style of living, but tend to have an North American look and design to them.

Houses are adapted in several ways to meet the demand for healthy housing. For example, the Japanese tradition of an unheated crawl space has been incorporated into and made part of the tempered envelop of the house. "Building science, generally is the same", says Armstrong, no matter where you are building. Adaptation has more to do with the architecture, planning and the details of a house and less to do with building science.

Turning to design, Mr. Armstrong's company pays attention to Japanese standards and conventions, working closely with Japanese contractors on the planning of a house. The Japanese usually have particular preferences for the design of bathrooms and the entrances to houses. A tatami room is also generally a requirement. Houses are much more likely to be popular, notes Mr. Armstrong, if you adapt the size of the house and use a two-storey building rather than a bungalow type of house.

## 5.7 Meeting the Challenge: The Export Council of Canadian Architecture (ECCA)[18]

ECCA is a market-driven cooperative of architecture firms. Started in 1995, it currently has five member companies, all from British Columbia. It has been trying hard to recruit members from other provinces and territories.

In Japan there is a building code specifically for three-storey buildings, approved in 1995. The Council therefore focuses on three-storey buildings built of wood. In this portion of the market, there is a willingness to engage foreign design services due to the lack of familiarity with this built form.

While the main foreign market at present is in Japan, ECCA missions have also been

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[17] This section is based on interviews with Jeffrey Armstrong, President of DAC International.

[18] This section is based on a focus group discussion with the Export Council of Canadian Architecture in Vancouver.

While the main foreign market at present is in Japan, ECCA missions have also been undertaken to South Korea and Taiwan. The Export Council has also undertaken one major project for CMHC's Research Division, comparing the costs of 2x4 construction in Canada and Japan.

A leading source of activities and revenues for the members at present flows from tours of Japanese groups searching for building solutions. Increasingly, Japanese buyers want turnkey solutions involving the whole building package, rather than design services alone. There are potential synergies between the design firms and suppliers of hard products. Moreover, by focusing on three-storey buildings, the Canadian architects are not competing with local design firms in Japan.

ECCA is interested in promoting the whole Canadian housing system, rather than just individual products. It can work well with others in the field, such as COFI and Canada Comfort Direct. They believe that design professions can play a key role in adapting Canadian housing technology to foreign markets. Some members believe that Canadian companies are still shipping products to Eastern Europe and Asia with designs and finishes entirely inappropriate to the local surroundings in the receiving country, e.g., a "Coquitlam spec home in Karlsbad, Germany". This could hurt Canada's reputation and also the reputation of Canadian design professionals, and it does not have to happen. All housing technologies need to be adapted to local markets.

### 5.6 Conclusion

The Canadian experience of adapting to the Japanese housing market shows both the positive and negative attributes of the market-entry process.

From the earliest days of Canadian efforts in Japan, the "Canadian housing system" has been at the centre of trade promotion efforts, and the Canadian approach to quality assurance has been a constant feature of marketing. At the same time, the main product sold in the Japanese market has been dimensioned lumber, which the buyers have incorporated into their indigenous building system more frequently than into North American-style "2x4" housing.

Some inroads have been made in changing the Japanese building industry culture, but they have been at the margins to date. There have also been difficulties in assuring the quality of complete Canadian housing packages and in valuing Canadian innovations like the R-2000 house as transferred to Japan.

Economic and demographic changes underway in Japan contain the seeds of hope for a "fresh start" there, in a situation where price coupled with quality may matter more, and local building traditions less.

Greater openness will, of course, be accompanied by greater competition from other foreign suppliers. Greater familiarity with consumer needs and expectations, coupled with fluency in Japanese, an on-the-ground presence, and a record of having "stuck with" Japanese partners through the crisis will all be vital selling points.

# 6. GERMANY: ADAPTING TO A STRONG REGULATORY CULTURE[19]

## 6.1 The Opportunity

Germany is the world's third largest economy, and Canada's fourth largest trading partner. It offers its residents one of the highest standards of living in the world. Germany is also one of the few countries on the globe able to tackle, unaided, the huge investment and reconstruction tasks it set itself in July of 1990, when it absorbed the former German Democratic Republic.

In the former West Germany, about 40 percent of Germans own their own homes. The typical German house costs nine times the average annual income. A house built with traditional methods may cost from DM 450,000-500,000. By contrast, the average dwelling in Britain costs five times the average annual income, and in the United States and Canada, only three times. German families frequently save for decades to buy their own home and therefore attach great importance to high quality.

Although there are requirements to reduce the costs of housing in the former West Germany, the main Canadian opportunity is probably in the so-called "Neue Laender" of eastern Germany.

The former German Democratic Republic was organized on "command economy" lines, producing over time a substantial backlog of social, physical, and environmental need, especially when coupled with the presence of hundreds of thousands of troops from the Soviet Union. Rebuilding eastern Germany has resulted in tremendous requirements for new housing and for building renovation in the heart of Europe, where demographic and economic trends have usually combined to produce only a modest-sized housing industry relative to population. Annual German housing production has typically been in the range of 500,000 to 600,000 dwellings, or about four times the Canadian annual rate.

For the past fifty years, many Germans in the east were denied the opportunity of home-ownership. The vast majority rented from state housing organizations or enterprises. Approximately a quarter of families in the former East Germany have become able to buy a house or an apartment through earnings and savings in the new economy.

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[19] This Chapter was shaped substantially by a focus group discussion with housing exporters from Atlantic Canada, most of whom were active in Germany, held in Halifax, Nova Scotia on June 29, 1998. Portions of this Chapter were adapted from *Housing Export Opportunities Series: Germany* (Ottawa: Canada Mortgage and Housing Corporation, 1997). Other portions have been based on information supplied by the Canadian Embassy in Bonn through the DFAIT Web Site.

Now that they find it possible to own a home, they want something affordable, durable and available quickly. There is very little prejudice against wood-frame housing. Since the cost of land is high, families usually want a house of between 100 and 125 square metres, at a price in the DM 250,000-300,000 range. Preferences are for two-storey dwellings on small lots. Home ownership savings plans are popular in eastern Germany and these will, in time, allow for healthy down payments.

Besides new construction, renovation of apartment buildings is also a fast growing sector, as little was spent on maintenance during the fifty years of Communist rule. Today, the vast majority of former state-owned apartment buildings require improvements or extensive renovations.

While demand is estimated at 470,000 units per year up to the year 2000 and a demand for another 380,000 new units every year between 2000 and 2010, output is lagging. Forecasts for the period of 1996-2000 alone place the housing shortfall of Unified Germany at 2.5 to 3 million units. An estimated 1 million people are housed in temporary or substandard buildings and over 100,000 more are considered homeless. This shortfall in supply has resulted in smaller living quarters and increased subletting. German interest rates are low and the market for lower-priced housing (up to DM 300,000) is good, particularly in the East German states.

## 6.2 Dominant Housing Technology

The German housing market is composed of a mixture of products and techniques as a result of the merger of the former Federal German Republic with the former Eastern Democratic German Republic.

Within the former West Germany, the dominant housing construction methods were in solid masonry, but with fairly rapid innovations in methods and high-quality results. IN the former East Germany, Soviet-style concrete-panel construction methods were adopted, with similar results: fair to poor quality of initial construction, and low maintenance of buildings once erected. In the New Federal States, housing units are much smaller, averaging 28 $m^2$ per person as opposed to 34.5 $m^2$ in the Old Federal States.

There are few developers in Germany. Turnkey developments, including landscaping, and house-shell coverings are not common practice. Building structures are usually delivered and owners subsequently contract with various sub-trades to finalize construction. Real estate development, typically, is not a full-time activity because of the numerous delays imposed by the various permits required for housing development at the municipal level. Public consultation is usually extensive and the process contributes to further delay. It is not uncommon to see three years elapse between the actual land purchase and the day the owner moves into the new home.

## 6.2 Challenges of Adapting

The German market appears to be more difficult to penetrate than the French or British markets. However, considerable potential does exist. This market requires long-term commitment as well as multiple and repeated contacts with German partners and customers.

A Canadian house with some adaptation to meet German technical standards, can obtain a regulatory approval with limited trouble or expense. Individual approval of each building is less time consuming and more cost effective. It is also preferable to purchase locally all electrical, heating and plumbing components.

The German construction industry has very high material and labour costs. Its delivery time for a pre-fabricated house is between 8 and 12 months. Canadian technology and methods should deliver the same building in less time at 65 to 75% of the local cost.

In Eastern Germany a home builder seldom acts as real estate developer. The idea of a company purchasing land, servicing a subdivision and selling houses is novel. While the idea is spreading very slowly, the legal steps involved in such real estate development are complicated and time consuming.

According to experts in the German market, the following are some of the key adaptation issues to be addressed there:

- Energy is expensive (one litre of heating oil costs approx. DM 0,45-0,60 in Berlin). Although the weather is not as cold as in Canada, houses must be well insulated.
- It is important for both consumer preference and regulatory reasons that both sides of a window be easily reachable from inside the house for cleaning; sliding windows are unpopular. Windows may need to have a single bar across them to meet the code.
- Built-in closets are very positively received by consumers; it saves on furniture costs.
- The tradition in Germany is for a tenant or house owner to buy kitchen cabinets separately. Whenever kitchen cabinets are included in the price of a house, it saves the family the trouble of buying and financing the kitchen; it is covered by the mortgage. This is appealing to many consumers.

German people put great emphasis on the environment. This creates a demand for the healthy living environment that wood-frame housing provides. Although Germans may be wary of wood-frame, Canadian suppliers are having some success in changing perceptions.

The potential for log homes appears to be more limited than for timber-frame housing in general. This type is still generally regarded as low-scale as Germans continue to favour stucco and plaster finishes. However, this is not true for Bavaria (where a four-storey wood home was built), or Baden-Wurttemburg and Hesse where the concept is widely accepted. Moreover, necessary official approvals are more easily obtained in Southern Germany.

### 6.3 Meeting the Challenge: The Work of Herbert Otto[20]

Mr. Herbert Otto of Otto Bryden Erskine Martel Architects Incorporated met with builders and professionals in Germany to determine their preferences for certain construction products and techniques. What he learned was detailed in a report for Canadian Mortgage and Housing Corporation entitled "A Comparison of Canadian and German Building Methods, Codes and Standards for Wood Frame Residential Construction". This report was commissioned by CMHC to provide the wood-frame residential construction industry in Canada some insight into the market potential of Germany, which is highly regulated.

As with many overseas markets, Germany does not share Canada's love of wood-frame systems. Trying to convince Germans of the natural advantages of wood-frame housing has not been easy although it is changing. As one builder in Berlin observed while pointing to Albert Einstein's former home, "If he could find security in a wood house as a physicist, why wouldn't anyone?"

Clearly, there is German interest in adapting North American technology. On the fact finding mission to Germany, Mr. Herbert found that the Germans are themselves producing a detailed document comparing the German and North American wood-frame residential construction practices. Mrs. Claudine Kapella at the Technical University of Munich spoke of their mutual interest and revealed that the university was also involved in experimental applications of wood-frame housing projects.

The market for low cost single family homes in Germany is much smaller than in Canada. Many Germans, both low income and middle class, live in apartment blocs. The dominant building method is stone and concrete construction. German housing traditionally uses stucco for the exterior cladding. While brick is generally acceptable, it doesn't have the same prestige as it does in Canada.

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[20] This section is based on an interview with Mr. Herbert Otto.

Wood-frame buildings continue to have some stigma associated with the uniform low cost products produced by the prefab industry in the sixties and in part with the assumption that they burn more easily than other types of housing. Less than 10% of single family homes use a German version of timber frame construction. This perception is changing with improved fire rating levels, sound control and excellent workmanship.

Canadian wood-frame has met with some success in the field of luxury housing and with custom designed quality houses. Canadian companies have been able to compete against the nationwide prefab companies by establishing good relations with local customers and authorities. The architectural flexibility and hand crafted perfection of these homes also aided sales.

### 6.4 Meeting the Challenge: Nascor Inc. in the Berlin Region[21]

Nascor Inc. has been active in the German market for over a decade. A Calgary-based maker of floor, wall and truss systems, Nascor recently established a factory 80 kilometres east of Berlin. The new plant, Nascor Holzbauelemente GmbH, opened in June 1997 and started manufacturing trusses and wall panels with the Nascor system. Although establishing a foothold was essential to improving Nascor's market share, making a profit has not been easy.

In recent years, government tax incentives have resulted in a huge oversupply of new apartment buildings. The construction industry is struggling with an overall jobless rate of 19 percent in the East. "It's overbuilt here with stuff that nobody wants," said Richard Dettbarn, Nascor's chairman and chief executive, referring to the glut of small apartments, especially in the Berlin area. "They've built all sorts of monolithic concrete stuff, but what people really want here is a single family house with a basement, a garage and a loft they can turn into a live-in-attic."

While many Canadian and U.S. builders have returned from Germany in frustration, Nascor is intent on finding a niche. Companies often get bogged down in bureaucracy and face a shortage of skilled tradespeople. Nascor has encountered the same difficulties with a lack of skilled workers, particularly framers. It also has had difficulties trying to convince consumers of the stability and durability of Canadian technology.

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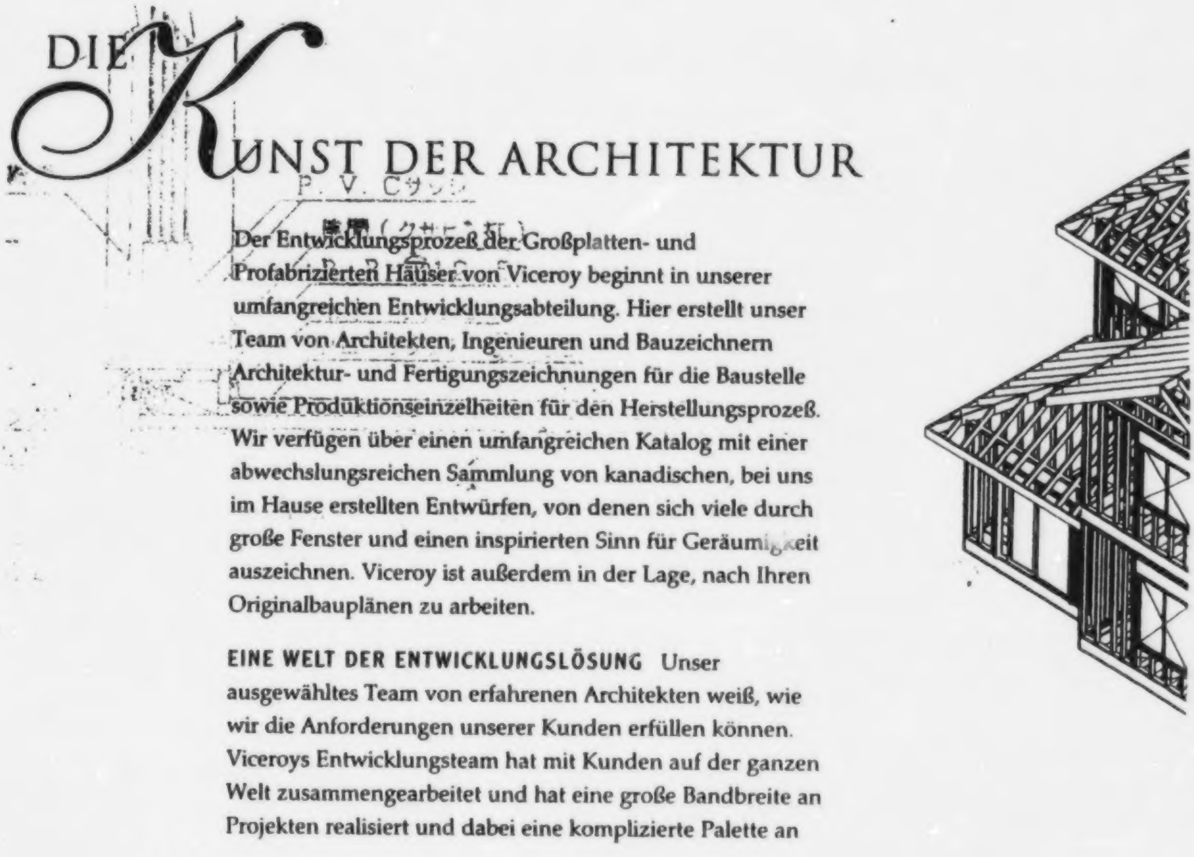
[21] This section is based on interviews with Richard Dettbarn, President of Nascor, and on information supplied by Nascor Inc., and an article by Alan Freeman, "Calgary housing firm builds in Germany", The Globe and Mail.

frame construction instead of concrete and stone. The advantage of Canadian technology is that it can save a lot of money over the traditional concrete and stone construction. Because of high housing costs, where a home can easily cost over 500,000 DM ($395,200), the savings are very competitive.

Costs were also cut by establishing manufacturing facilities in Germany. The freight costs of importing pre-built wall assemblies and trusses from Calgary had become prohibitive. Time consuming logistics and the need for extremely secure packaging added to the costs.



# DIE KUNST DER ARCHITEKTUR

Der Entwicklungsprozeß der Großplatten- und Profabrizierten Häuser von Viceroy beginnt in unserer umfangreichen Entwicklungsabteilung. Hier erstellt unser Team von Architekten, Ingenieuren und Bauzeichnern Architektur- und Fertigungszeichnungen für die Baustelle sowie Produktionseinzelheiten für den Herstellungsprozeß. Wir verfügen über einen umfangreichen Katalog mit einer abwechslungsreichen Sammlung von kanadischen, bei uns im Hause erstellten Entwürfen, von denen sich viele durch große Fenster und einen inspirierten Sinn für Geräumigkeit auszeichnen. Viceroy ist außerdem in der Lage, nach Ihren Originalbauplänen zu arbeiten.

**EINE WELT DER ENTWICKLUNGSLÖSUNG** Unser ausgewähltes Team von erfahrenen Architekten weiß, wie wir die Anforderungen unserer Kunden erfüllen können. Viceroys Entwicklungsteam hat mit Kunden auf der ganzen Welt zusammengearbeitet und hat eine große Bandbreite an Projekten realisiert und dabei eine komplizierte Palette an

Canadian marketing literature for Germany (Courtesy Viceroy Homes)

The German plant is designed to supply products for a housing projects being put up by Nascor and also projects by local builders. Initially, Nascor supplied two projects, one in Kleinmachnow and the other in Vehlefanz, both on the outskirts of Berlin. Among its recent contracts is a 47 unit project being built by a public housing agency in the Berlin region and a 275 unit development in Michendorf, another Berlin suburb. In each case, the company is supplying framing packages.

Nascor began with an investment of more than five million marks in its Berlin operation, which started with 38 employees. Germany accounted for a total annual revenue of $20 million in the company's first year.

Profits have become increasingly difficult to come by, however. To address this, Mr. Dettbarn is aiming to increase its direct sales to customers rather than acting as a turn-key contractor to a developer. The company continues to promote the durability of wood-frame houses by dealing with consumers themselves. Plant manager Amir Ahmadi commented that customers often ask how long Nascor's houses last, to which he replies "forever".

### 6.6 Meeting the Challenge: The Work of the Ecological Housing Institute[22]

The Ecological Housing Institute (EHI) serves an important role in facilitating the adaptation of Canadian housing products and services to the German market. With contacts at a wide variety of research institutes in Germany, EHI had access to information about the German market and their work on codes and standards. George Reinecke, who established EHI, believes that Canadian companies could be leading manufacturers of housing if Canada were to emulate Germany's high standards and regulations.

In his experience with the German market, however, Reinecke knows that there is a real need to focus on the preferences of the German consumer and on product development. Housing is one of the most complex products to export. It combines traditions and cultural expectations to which any exporting company must pay close attention. If the major focus is on rules and regulations, the more important factor of customer demand may be missed. The question to ask is have we got something that a German customer will like, posits Reinecke.

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[22] This section is based on interviews with Mr. George Reinecke, and on information supplied by him to a meeting of the Canadian Housing Technology Export Network, held in Winnipeg, Manitoba in June of 1997.

In particular, Reinecke suggests looking at the preferences of Germans aged 25 to 45. Many in this segment of the population currently live in apartments and want to move to houses. Finding out at least what 20% of younger consumers will accept is a matter of trial and error sometimes but very important. Moreover, Germans living in Canada clearly prefer wood-frame houses as long as they are well made. The conclusion that can be drawn is that Germans are not entirely loyal to masonry housing.

Canadian companies must also focus on the niches where they can be competitive. Trying to compete with German masonry manufactures is a lost cause, because this is the domain of German companies. Where Canadians do have an advantage is in the prefabricated housing industry. Canada has a reputation for energy-efficiency and taking the environment into account. Masonry housing is not as sensitive to the environment. However, prefabricated housing that embraces healthy or energy efficient housing can compete much more easily.

There are a number of ways in which houses can be made more environmentally attractive. Under German standards, prefabricated houses usually have an energy consumption level of 50 kw hours per sq mt. Canadian companies provide competitive thermal efficiency if they can go below this level. They must also tackle the problem of ventilation in healthy housing, but in such a way that electricity costs are kept low. Electricity costs are high in Germany, and consumers are sensitive to this. In addition, mechanical energy needs and water consumption rates must be kept down to a minimum.

Reinecke notes that an attractive house is more than a high quality frame. By developing and integrating German concerns for efficiency in such areas as heating costs and water consumption, Canadians stand to benefit. When it is left to the Germans to install the aggregates, then the much of the benefit may accrue to the German developer. Moreover, companies may put up a wood frame and end up employing subcontractors who don't know the product leading customers to associate the Canadian product with poor quality.

## 6.7 Conclusions

The "new" German housing market combines a major opportunity with a challenging regulatory environment. Both past traditions and the high cost of housing combine to produce quality requirements seen only in a few other markets. Even the Japanese market does not set the same standards. However, the German market is becoming more open-minded about *how standards can be achieved*, under the combined pressures of a housing shortage, the low productivity of the German building industry, and actual experience with wood-frame methods.

## 7. RUSSIA: ADAPTING IN A RISKY ENVIRONMENT[23]

### 7.1 The Opportunity

Besides creating inefficiency in materials distribution, undermining innovation in construction methods, and laying the foundations for corruption, a state monopoly over housing contributed to chronic housing shortages in the Communist Soviet Union. The queue for state-sponsored housing reached a record 10 million in 1992. To the extent that housing was considered part of the benefit package for employees of state enterprises, it also generated inefficiencies in both industrial enterprises and in housing provision.

Since the breakup of the Soviet Union in 1991, the Russian Federation housing sector has undergone a significant transformation. Much of the stock has been turned over to former tenants, and most state construction and materials manufacturing enterprises have been privatized. The role of government in both producing and allocating apartments has been reduced dramatically, though it still exists formally and informally.

The quality of Russian housing varies tremendously, particularly between urban and rural areas, and as between management and labour. Overall, it is safe to say that the majority of the stock is inadequate to meet the needs of Russian households. Experts estimate that 25 percent of households share a dwelling or live in dormitories. In large cities, which accommodate some 63 percent of the urban population, individual house construction was forbidden until 1988, but is now one of the most active parts of the market.

Annual production, at perhaps 500,000 to 600,000 dwellings per year is half or less what would be required to overcome the backlog of need arising from internal migration, crowding, resettlement of returning military officers, and replacements for substandard dwellings in both urban and rural settings.

Since 1992, with support from the World Bank, the United States Agency for International Development, the German government, and other organizations, there have been considerable efforts to restructure housing production systems and ownership patterns within the existing stock.

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[23] This Chapter draws on some of the information presented in *Housing Export Opportunities Series: Russia*, as well as on reports of the World Bank Housing Reform Project team, and of The Bayswater Consulting Group, Inc. prepared for CMHC and the World Bank.

Legal reforms have clarified property rights somewhat and established a preliminary framework for the operation of land and property markets. The increasing government deficit has affected the amount of housing subsidies available, which in turn has contributed to the decline in housing input and decreased capital investment in the state-controlled sector.

The huge transfer of wealth that accompanied housing privatization has sparked the development of private housing markets. Both housing mobility and trading of dwellings have been rising significantly. Most transactions have been financed by cash, mostly in U.S. currency.

While the market has become saturated in some regions, demand for the Russian version of "carriage-trade" housing outstripped supply by a factor of two or three in the years after 1991. Apartments in prime central locations sold for US$3,000-$7,000 per square metre. These units were often lavishly renovated units in former communal apartments built during the Stalinist era, or special low-rise housing built for high-level government bureaucrats in the late 1970s.

The market for single-family dwellings has also expanded rapidly, with prices in Moscow ranging between US$1,000-$3,000 per square metre, depending on factors such as amenities and accessibility.

"Dachas" -- temporary residences or summer cottages -- attracted a large share of household savings in the days of Communist Russia. However, their year-round use has been inhibited by the lack of utilities, poor transportation, and limited local commercial and social services.

## 7.2 Dominant Housing Technology

Under the Soviet regime, Russian house-building methods were dominated by use of concrete panels and sometimes brick to erect apartment buildings. Urban dwellings usually have two to three rooms and are well served by water, sewerage, electricity, paved roads and central heating.

Since the 1960s, Russia mass produced high-rise buildings in housing estates built in the urban perimeter. These vast uniform complexes make up 50 to 70 percent of urban housing. They are made of prefabricated elements with an average size of 55 meters.

There is a great need for the renovation and construction of the current housing stock, although the demand is hampered by a deficient legal framework and limited consumer financing. Tenants who live in these complexes suffer from poor quality structures which have had delayed or little upkeep.

The buildings are poorly insulated and can be very energy inefficient. Structural problems often contribute to high maintenance costs over the long term.

Although many Russians live in apartment complexes, demand for home ownership will continue to grow in an inflationary context. Potential for growth exists in 50 to 70 square meter detached or semi-detached houses which are competitively priced. Growth is much slower in the residential market, however, than in office buildings.

## 7.3 The Challenge of Adaptation

Housing quality is a major problem in Russia where more than 40 percent of the housing stock needs major renovation and upgrading. The share of substandard urban housing is over 7 percent. Some estimates suggest that 420 million m2 of state-owned housing requires repair work at a cost of US$10 billion. So far, due to chronic shortages of funding, the government has delayed maintenance and is not considering a comprehensive program of housing rehabilitation.

Water supply and sewerage systems are much better developed in urban areas, as cities have traditionally attracted a larger share of state investment in infrastructure and services. Lower levels of infrastructure provision in the rural areas has led to a much lower quality of rural housing. Over 50 percent of the rural housing lacks running water, sewage facilities and central heating. The quality of owner-occupied urban housing is drastically low; over 80 percent lack basic amenities.

Low wages coupled with high housing costs and mortgage rates have reduced housing demand for owner-occupied housing. Shortages of housing under the Soviet system have been replaced by shortages of affordable housing. Due to the establishment of a housing market, the ratio of average house prices to average income fell considerably during the period 1991-95. Three average monthly salaries are sufficient to buy approximately one square metre of dwelling space in the urban centres. Another problem facing households is the operation and maintenance of the former public housing stock. Homeowners are struggling to raise money to pay for services previously unpaid.

A demand for high quality flats and single-family homes from the new middle and upper classes might be significant for the new owner-occupied market. Various income groups are also willing to invest in the upgrading of their existing housing, consequently spurring an increase in renovation activity.

## 7.4 Meeting the Challenge: Stefan Grossman-Hensel's Work in Baikalsk[24]

The Baikalsk Pulp and Paper Mill (PPM) sits beside one of Russia's most treasured natural wonders, Lake Baikal. As the world's deepest fresh water body, the lake contains rare species of fauna and flora found nowhere else. In some ways the mill is ideally located, given the Irkutsk region's plentiful forests. Although PPM produces some of the world's best cellulose pulp, production is having a very detrimental effect on the region's precious ecology. With the growth of ecotourism to Lake Baikal and environmental concerns, the mill is being forced to reduce and eventually stop production.

These changes are bringing new ideas to the company which has decided to take advantage of forests in the region for a different purpose. With good connections to the railroad network as well as timber producers in Siberia, PPM wants to begin to produce structural lumber. Moreover, the decision has been made to re-introduce wood-frame construction to the area.

This is where Canadian, Stefan Grossman-Hensel stepped in to the picture. Stefan approached the management of the mill with the idea that wood-frame construction could be a profitable enterprise for the company. He saw the potential for the company to become a major developer of wood-frame construction by assisting in the production of building materials specific to wood-frame technology.

Although the Russians living in Irkutsk are certainly not unfamiliar with the use of wood for housing, the Soviet era left a legacy of concrete housing and rows of ugly apartment buildings. Technological advancements in wood-frame housing generally missed this region, and denizens now consider such systems as more fire prone, less stable, and not terribly efficient in cold winters. Most houses built before the Russian revolution in 1917 were simple peasant-log homes which looked decrepit against the Soviet mass produced concrete housing.

Together with two Canadian architects/builders and PPM, Stefan is helping to overcome Russian prejudice towards wood-frame construction. The first houses demonstrating wood-frame construction were built in 1993 with financial assistance from the Canadian Bureau for International Education (CBIE). Goals of the project included training six carpenters in the use of wood-frame technology, producing a video documenting and promoting the process for Russian television, and preparing a construction manual with details specific to Russian codes and standards and the use of Russian materials.

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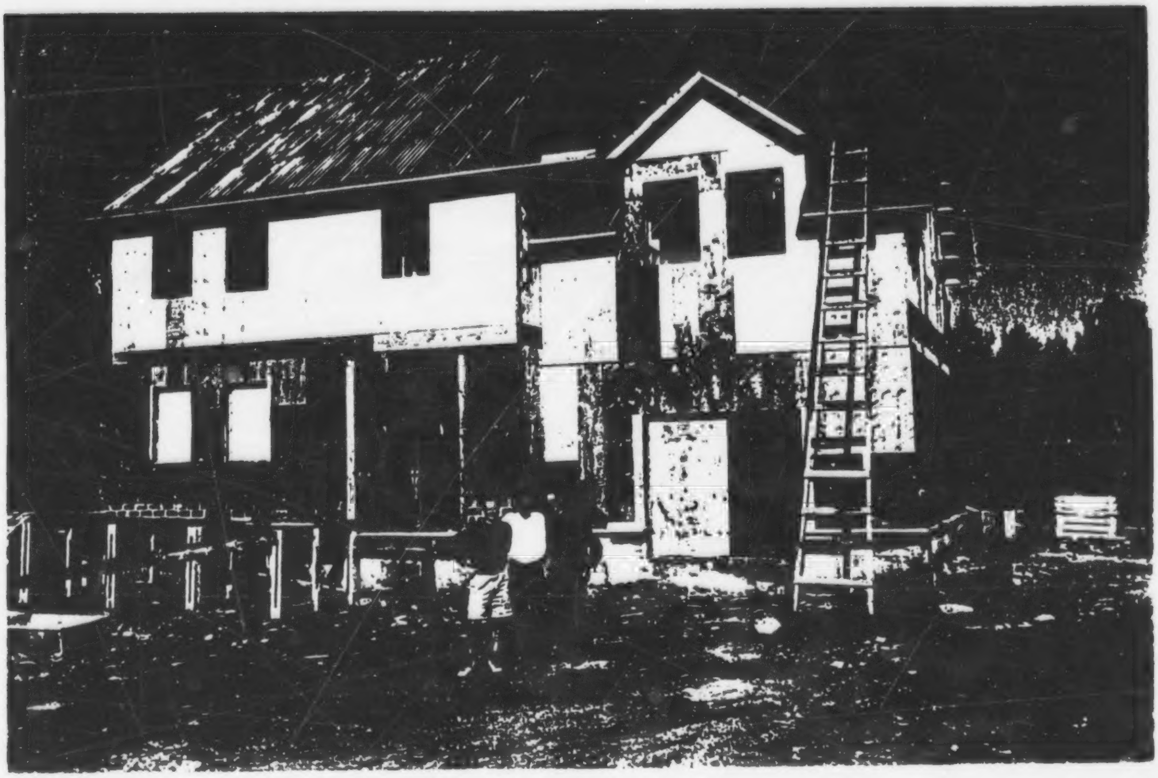
[24] This section is based on an interview with Stefan Grossmann-Hensel and Jason Grant-Henley, and on extensive documentation supplied by Stefan Grossmann-Hensel.



Russian housing demo unit in Canadian wood-frame on Lake Baikalsk (Courtesy S. Hensel)

The Baikalsk PPM prototypical units were first built in city of Baikalsk, a relatively new city established between 1965 and 1975 with a population of 17,000. This place is closer to the Far Eastern city of Vladivostock than to Moscow by about one third of the distance. It is located only about 120 km north of the central Mongolian border.

The prototypical units incorporate a number of adaptations based on Russian design while taking advantage of Canadian technology. The Russians chose to work with an American house design that gave the perception of a "rich and solid" house. While the design by no means replicates the veritable castles built by the newly rich Russians, this two-storey, 2800 sqft home offers an attractive lower-cost alternative. Adding brick cladding to the house made an important difference in people's perception of its solidness and its worth.

Stefan introduced the Russian builder to the use of and the concept behind vapour barriers. Conventional Russian masonry and concrete construction does not require a vapour barrier. After taking the time to properly explain this building component and to ensure its proper use, the Russians worked on installing a continuous polyethylene barrier. Stefan found that caulking glue was not available and, as an alternative, double adhesive tape and staples had to be used to join the sheets at the overlap.

Interior walls and ceilings required some adaptation as well. The idea of using wood panelling was turned down because it did not fit the Russian image of a modern house. Gypsum board would have been ideal, but it was not available; and a lack of suitable craftsmen meant that plaster could not be used.

The house had to use plywood instead despite its higher cost and increased susceptibility to fire. Builders chose to cover the plywood with wall paper which also had drawbacks since the movement and shrinkage of the wood-frame and plywood sheets overtime will eventually rip the paper. Stefan recommended cutting the paper with a sharp knife where it is covering the plywood joints and putting moulding on it if necessary.

A major difficulty encountered by the Canadian team was the Russian code requirements such as sound insulation between floors. Although the first house could not overcome these requirements, the project succeeded in getting them waived for subsequent units.

An important step toward resolving the issue was obtaining the support of the Chief Architect for the Irkutsk Region, Prof. Vladimir V. Ickakov. Fortunately, Prof. Ickakov understood the advantages of wood-frame construction and assured the Canadians that he would instruct his inspectors to approach this system with an open mind. The successful acceptance of Canadian standards in Irkutsk, particularly since it is an earthquake prone region, helped to promote the system in other parts of Russia.

Nevertheless, with Prof. Ickakov's support and others, work continues towards the inclusion of the Canadian wood-frame system in the Russian building code. In adapting Canadian technology to the Irkutsk region, Stefan summed up the following considerations. Prototypical units need to be developed which:

- are cost efficient;
- could be partially pre-fabricated;
- can easily be adapted to changing site conditions; and
- can easily be adapted to changing user needs.

The availability of materials locally determines in large part the development of a design. To be cost efficient, a house needs to use these materials to the maximum extent possible. A conceptual design can start the process and then be refined according to the choice of building products. Canadian projects, such as this one which have taken Russian design and the details required for the construction into consideration, provide a good starting point for future adaptation.

### 7.5 Meeting the Challenge: Thomas Cochren Homes International Limited Work in Tver Oblast[25]

Flowing from CMHC work in the Tver Oblast, Thomas Cochren Homes International Ltd. was formed in 1996 to construct Canadian wood-frame housing in Russia. The principal was one of the main trainers in the Tver pilot program in 1994, along with the Ottawa Valley-based Drerup Armstrong Limited.

The Russian partner in the new venture is a former state-run enterprise, the BETIZ construction company, founded in 1977 and privatized and turned into an open joint-stock company in 1992. BETIZ was eager to learn about and work with new technologies. The company adopted production techniques for windows from plastic with thermal glazing based on German technology, Canadian lumber production technology and Canadian wood-frame housing technology. Their initial project of ten townhouses was built in downtown Tver on part of a 4.5 hectare urban renewal site that BETIZ owns. The houses are 1600 square feet each and use standard wood-frame "stick-building" technology on pre-engineered, precast concrete foundations.

A key component of the involvement of Thomas Cochren Homes International was on-site training of BETIZ construction workers by key personnel from Canada. Construction materials were also shipped from Canada for the project. In September/ October of 1997, a team of Russian workers came to Hamilton, Ontario for further training in wood-frame techniques, at the expense of their Russian employer.

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[25] This section is based on interviews with Thomas Cochren and with Nicolai Zimenkov of BETIZ, as well as on personal visits by the author to the projects in question, and an extensive company report on Canadian wood-frame technology prepared in Russian and English by BETIZ.

The latter has now invested more than US$ 1 million in retooling for the new housing technologies, including purchase of Canadian wood-processing machinery and equipment, window-production equipment, and other items. An enterprise formerly devoted mainly to concrete panel systems has converted largely to Canadian technology.

Future joint programs of the joint venture include training in architectural design and construction administration, training of Russian workers in Canada, sourcing of more Canadian materials for export including machinery to fabricate some components, construction of four more developments, including one in Moscow, and establishment of a joint-venture construction company in Russia.

## 7.6 Meeting the Challenge: CMHC and Bayswater Consulting Work on Reform of Russian Building Codes[26]

From February to August of 1994, CMHC worked under contract to the World Bank to test light-building technology concepts for an initial housing loan of U.S. $400 million scheduled for initiation in 1995. Working through project manager The Bayswater Consulting Group, Inc. and a multi-disciplinary team of Canadian organizations from both public and private sector, the project:

- trained and equipped new and existing builders, including retraining military officers leaving the armed forces as builders, to bid on and carry out construction projects financed by the Bank and other sources of financing.
- developed and tested models of how to promote North American investment and joint ventures in building materials enterprises and defence conversion;
- demonstrated tangibly what can be done with local materials and labour using transferred light-weight technologies.

In the course of the project, three courses in building management, building technology, and building methods were quickly organized and delivered to current building industry executives, construction crews, and new builders from both military and civilian sectors. A total of about 60 participants and 45 graduates benefited from the courses, the first of their type ever given in Russia. Two extensive, detailed training manuals and associated training aids were completed in Russian and English, based on available Canadian materials. These were the first new texts in the field made available in Russia. Specific training aids in Russian were also developed relating to forced-air gas furnaces.

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[26] This section is based on reports prepared by The Bayswater Consulting Group, Inc. for CMHC, on direct involvement with the project, and on interviews with John Herbert, formerly of CMHC.

Former military officers taking part in the course formed a small construction company as a direct result of their training, and were equipped with tools by Canadians. The new company immediately began to secure private building contracts.

The Russian Minister of Construction singled out the Canadian trainers and specialists for high praise for their grasp of Russian circumstances and their professionalism.

In the period after the World Bank contract was completed, Canadians offered hands-on training in masonry cladding techniques for wood-frame construction to the Russian company engaged in finishing exterior of the demonstration house. Masonry veneer techniques were essentially unknown in Russia, as most dwellings were built in solid masonry, solid wood, or concrete panels.

More than a dozen technological innovations designed to reduce the cost of housing construction and increase energy efficiency of buildings were introduced to this region of Russia.

Over the next two years, Canadians involved in the project completed a demonstration house, helped convert two major Russian builders to wood-frame technology, shipped Canadian machinery and equipment for wood-frame production, and helped set up an ongoing Russian-sponsored training institute in wood-frame construction methods.

Today, there are three active construction companies using wood-frame building methods in the Tver Region, and the numbers of homes produced in this manner are pushing over the 100 mark, all entirely based on Russian management, labour, and many locally-produced building materials.

## 7.7 Conclusions

The need to secure payment and to hedge against risks pervades consideration by Canadian companies of the Russian market. For building material suppliers, the approach has been simple: cash in advance of shipment. For those involved in actual construction projects, however, the challenge is obviously more complex, especially in the absence of mortgage financing, insurance and other mechanisms taken for granted in Western Europe and North America. The most successful companies are those which have adapted Canadian wood-frame technology to the requirements of Russian clients in provincial (Oblast or Republic) governments, in natural resource development companies, or among builders.

## 8. CHINA: ADAPTING BOTH AT HOME AND ABROAD[27]

### 8.1 The Opportunity

Following a long period of providing housing according to a command economy structure, the People's Republic of China is now more open for experimentation than ever before in its 50-year history. As with many countries, China has a rapidly growing population and a government increasingly willing to work with foreign investors and contractors to meet its housing requirements. The central government's domestically funded "Comfort Home Project" allocates a total investment of US$1.5 billion to low-cost housing. The project will strive to build 25 million apartments by 2000, or roughly 2.5 million annually. The majority of products used in low-cost housing will be domestically produced. This project offers significant market opportunities for Canadian companies producing in China.

Home ownership is an important part of the Chinese value system, and it indicates financial success and stability. The major difficulty for many is affordability. Price sensitivity does not necessarily reflect a lack of money but a concern about avoiding waste. Although there are over 220,000 manufacturers of building products in China, Canadian products are considered to be of high quality, and Canadian construction related companies are greatly respected by the Chinese.

The demand for imported building products has grown rapidly as China enters its most significant development boom in recent history. Increasingly, opportunities now exist for foreign manufacturers of building materials. At the present, China continues to be a major importer of wood products, gypsum, plasters, sand, nails, fencing wire, and aluminium tubes and bars for its building industry.

The Chinese government's policy for 1996-2000 focuses on reforming the management and operations of China's large and medium size state-owned firms so they can meet the requirements of a market economy. Other major policy directives include the development of the building materials market and the adoption of new technology to modernize production, reduce energy consumption and raise product quality.

In this time of transition and accelerated growth, there are significant opportunities for Canadian companies. The question remains of how to most effectively and economically access this large and complex market.

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[27] Portions of this Chapter are based on *Housing Export Opportunities Series: China* (Ottawa: Canada Mortgage and Housing Corporation, 1997). Other portions are drawn from information prepared by the Canadian Embassy in Beijing and available via the DFAIT Web site.

In the north of China, there is a strong need for energy-efficient building materials. The need for cost-effective, light structural materials for multi-storey buildings was raised repeatedly. Although the above materials are required, local representatives recognize that building materials produced in China by Sino-Canadian enterprises will be more competitive than materials imported from Canada. It is generally felt that if quality control was maintained and if price differences were not too significant there would be a strong demand for these products in the region.

In China's major urban centres the newly emerging middle and upper classes, with their high disposable incomes, are spending between US$4,000 to 10,000 to renovate newly purchased apartments and condominiums. Hardware stores are adjusting to the relatively recent demand for home renovation products. The traditional hardware stores are being replaced or joined by modern stores that are beginning to carry imported products including hardware, lighting fixtures, ceramics, plumbing fixtures, tiles and wall paper.

## 8.2 Dominant Housing Technology

Masonry (brick) construction predominates. Unfortunately, bricks are the main environmental culprits in Chinese housing because of the energy needed to produce them, the pollution caused by their production, and the agricultural land they consume.

The use of wood is limited to interior decoration and furniture, except in some rural areas, where traditional housing is built of wood. There is a lack of forest resources to maintain the use of traditional wood-frame and masonry-wall housing structures.

The methods and skills of construction companies and workers revolve mainly around brick bearing-wall construction or, for slab and tower buildings, poured-in-place concrete frame structures. Ready-mixed concrete and construction cranes are widely used in large cities. Domestic construction quality is not high. Labour is cheap. A lot of work is contracted to rural construction companies. Construction time is relatively fast. A national construction module of 300 mm x 300 mm aids construction speed, quality and coordination. Formwork made of re-usable steel panels conforms to the module.

The ubiquitous walk-up apartment buildings are built with brick bearing walls and pre-fab floor slabs. Slab and tower structures are poured-in-place concrete with some pre-fab exterior wall panels. Villas in the suburbs of most cities are built entirely in brick.

Computers are now more actively used for design and the software is adapted to the requirements of China's codes for structure, foundations, heating, ventilation and air-conditioning, lighting, and quantity surveying.

The Chinese government is also interested in the use of indigenous materials that are abundant or waste materials such as straw or bamboo. Straw can be made into particle board. Bamboo can be used as hardwood flooring. In most cases alternative materials are unavailable and poor-quality building materials continue to be used, contributing to a dramatic loss of farmland, high energy consumption, and environmental degradation.

The use of insulation and other energy-conserving methods is just entering mainstream construction practices in China. Work in this area, at least for the next five years, will mostly be retrofit of existing buildings. The main insulation materials are rockwool, foamed polystyrene panels and expanded perlite. A new method becoming more common in Beijing is to apply gypsum board-coated polystyrene panels to the interior wall and at the exterior of flat roof slabs.

The government's goal by the year 2000 is to have new, thermal efficient building materials make up 20 percent of materials used. New materials that have been tried include aerated concrete masonry products, gypsum board, asbestos cement board and many kinds of lightweight composite board combined with fiberglass, glass wool, polyphenyl foamed materials, hollow bricks and waste slag materials. New materials have been used in only 11 percent of buildings.

## 8.3 The Challenge of Adaptation

Opportunities and regulations for housing differ from region to region. Variations stem largely from the different degrees of economic development. Consequently, it is imperative that Canadian housing firms develop a careful understanding of specific regional market needs and build an array of access contacts.

Despite Canada's leading-edge technology and expertise, the Canadian housing market is not well placed to take advantage of significant business opportunities emerging in China. The industry must overcome the structural limitations of fragmentation and small size, and become aware of the potential for export to non-traditional markets. Canada's housing sector must also gain a greater appreciation for the importance of cultural differences.

Chinese society is more status-conscious and hierarchical than Western society. Business relationships tend to be much deeper than in North America. The economic system is based on a web of carefully maintained interpersonal relationships.

There is a recognition that although Canadian products are more expensive than local alternatives, in the long term their use saves energy, preserves natural resources, and improves quality of life.

Particularly in the northern provinces -- Heilongjiang, Liaoning, Hebei and Jilin -- it was widely recognized that Canada and China face similar climatic challenges and that Canada has developed well-adapted and high-quality building products to meet these challenges.

China also welcomes innovations in masonry structures. Of prime concern will be a system's structural characteristics and whether they meet China's standards. Most of China is earthquake-prone. If a housing project using masonry passes the approval from Chinese authorities, then is relatively easy to fit other Canadian products, materials and technologies into it.

Another challenge is to work with an existing Chinese shell (six-storey walk-up or high-rise). By adding products to typical Chinese buildings, Canadians will be directly entering the huge, 200 million square metres per year mainstream of Chines urban housing. Although Chinese shells are very rough, this roughness should be seen as an opportunity to introduce improvements. If Canadian firms are unwilling to adapt their products to the Chinese shell, then they risk losing or severely limiting their access to that market.

## 8.4 Meeting the Challenge: Mascon Engineering Limited[28]

Canadian manufacturers, such as Mascon Engineering Limited, offer products that confront China's challenge. Mascon gained prominence in a competition jointly initiated by the Canadian Mortgage and Housing Corporation and the Chinese Ministry of Construction. The competition sought the most viable design and building technology for the construction of a low-cost housing demonstration project in China. Mascon's proposal supplied Canadian technology in the form of a concrete construction system for walk-up apartments.

China's cities are dominated by low cost apartment buildings. The demand is for six to seven storey walk-up apartments that use low cost materials and low cost construction. Moreover, there is lack of quality low cost materials.

Mascon's low cost housing system boasts several advantages for apartment buildings including the necessary first floor storage space for bicycles. It also makes effective use of limited land space and requires low building maintenance. Mascon's cast-in-place concrete produces a building that is fire resistant, rot and termite free, has low noise transmission, good thermal capacity, and is environmentally friendly.

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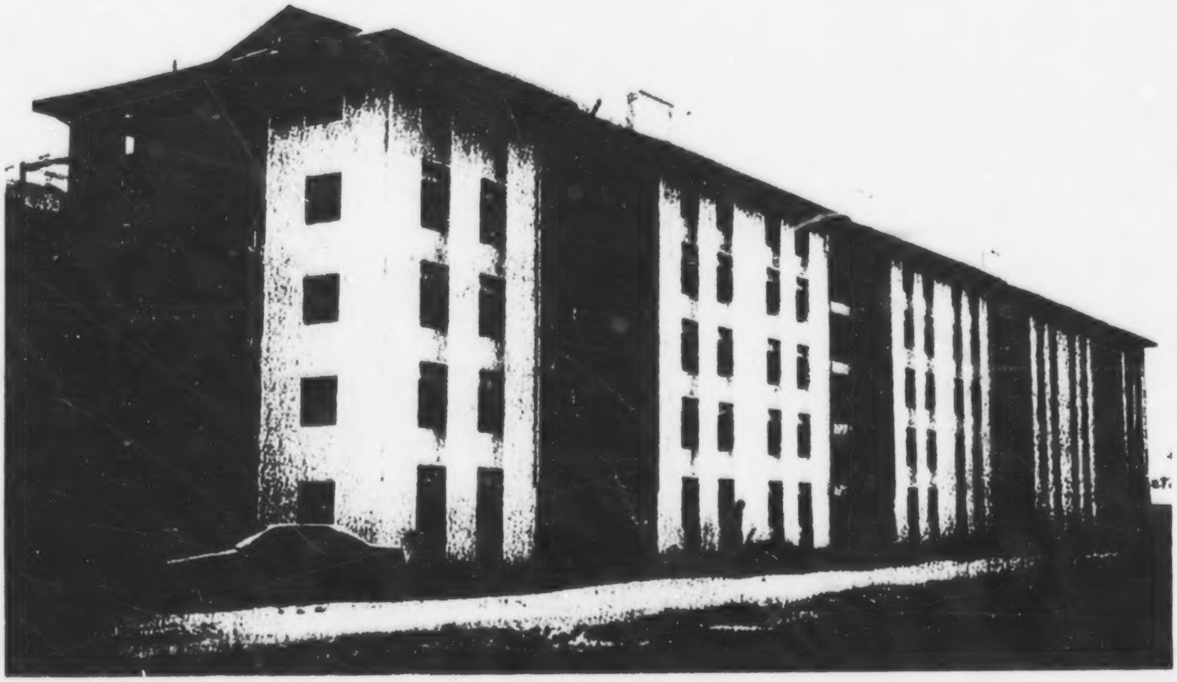
[28] This section is based on information supplied by Mascon Engineering Limited and on interviews with Mr. Bill Malone, President of Mascon, as well as with Pierre-Paul Turgeon, manager of CMHC's development project in China.

The system reduces infrastructures costs, construction costs, costs for lifts and stairs, and heating and cooling costs. By incorporating up to 80 percent of indigenous materials, the Mascon system can be exported more cheaply than other Canadian technologies. As a result, the system has found its way into international markets in Asia and the Middle-East.



Low-cost housing system (Courtesy Mascon Engineering Limited)

## 8.5 Meeting the Challenge: Kingsley Lo and Vancouver's Oriental Housing Market[29]

From the ground up, building relationships between Canadian architects and Chinese clients involves key elements integral to any form of intercultural negotiation---a strong commitment, explicit communication and trust. The process often involves a close triangle relationship between designer, 'agent' or mediator and client. Within these parameters, the architect must find innovative solutions to design challenges which face any project, regardless of the home owner's nationality.

"Working with Oriental clients is a two-way street. You adapt to their needs while educating them to adjust to the Canadian lifestyle," states Kingsley Lo of Kingsley Lo Architect Inc. in Vancouver.

Lo cautions against making generalizations. There are Oriental clients who are very open-minded and others who have very specific requests. And, these requests may not be from their own culture, for example, some demand very European influenced designs. Generalities should also not be made concerning architects' translation of clients' needs.

Lo says, "Before establishing the working relationship, each client is seeking two things, design expertise and trust." His clients have their lawyer, banker or an agent for whom they have already developed trust source the architect. Through the agent, the client will conduct thorough screening, initially rejecting any direct contact, preferring that his identity not be known. "Gradually the agent is relinquished and direct communication takes place. Ironically, it often leads to very close friendships."

Lo, who began his company in 1972 working with mid income Caucasian clients, has now established his business within the wealthy Asian community for obvious financial reasons. He cites design awards, media attention and business referrals as crucial to his success. He has received five Gold and seven Silver Georgie Awards from Canadian Home Builders' Association of BC's New Home Awards. His 1996 entry, designed for an Oriental client, garnered top national honours from C.H.B.A. for "Best Single Detached Home Over 2,200 sq. ft. in Canada". His work has been featured in publications including Sing Tao, Ming Pao and the industry publication "In" Magazine distributed in China, Hong Kong, Taiwan and Canada.

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[29] This section is based on an interview with Kingsley Lo conducted by Carol Crenna, and on materials supplied by him.

Though his knowledge of traditional Asian culture and language (his mother tongue is Cantonese and he has learned Mandarin) has been beneficial, Lo asserts that it is his schooling and experience in North America that gets him hired. "The reason they're using an architect from Canada is to incorporate Western design. Otherwise they would hire from their own country."

Housing systems and technology differ little from an Oriental home to a Canadian one. Yet, the following cultural differences can affect final design.

- Bedrooms: More of the floor plan is designated to sleeping quarters. The Chinese culture, which values close family relationships, allows children to remain in their parent's home until marriage. This requires larger bedrooms. Lo states, "One client requested that the master bedroom be made smaller to accommodate children's rooms. I suggested it would not be wise for resale value to have the master suite smaller than the standard but he insisted, saying the children's requirements were more important." It is also common for Oriental clients to request two master bedrooms of equal size, one being for grandparents. Also, business clients are accommodated in their home, rarely staying in a hotel. To create the appropriate image, these accommodations must be substantial. To entertain them, a spacious open living and dining room floor plan and a large entry are also included in Lo's designs.

- Lighting: Chinese clients appreciate very bright, airy homes, though the reasoning may be more climate than culture related (since Vancouver has fewer sunny days than Hong Kong). Lo says the word "cozy" is not recognized. Special attention is given to the way natural light penetrates the space, incorporating skylights, large windows, solariums and glass doors opening to backyards.

- Finishing: Aspects of longevity translate into every part of the home from foundation to finishing. Clients opt for stone wherever possible, considering it an investment for future generations. Since fine craftsmanship is traditionally synonymous with durability, they prefer a formal atmosphere created by meticulously finished products.

- They have little appreciation for the North American trend toward "rustic", "natural" and "weather worn" treatments. Lo says, for example, when finishing wood or siding has a contemporary rough surface, the Chinese client will ask when it will be sanded smooth for his use. Since antiques from the Orient average several hundred years old, Western antiques are considered simply "used furniture" and not of great value. They will, however, complement their own furnishings and art with North American styles.

Moving water symbolizes life and prosperity and therefore fountains and other flowing water are very popular both inside and outside the home. Lo explains, "It is their reasoning that, in history, all major civilizations began along rivers like the Nile, Ganges, Amazon."

Landscaping may or may not include a large lawn. Whereas some clients, unaccustomed to the upkeep, prefer limited expanses of grass and flowers, one of Lo's clients requested a "Stanley Park setting" in his front yard. White flowers are never used in landscape design due to their significance with death. For the same reason, shades of white and black can offend if used extensively in any area of the home.

The common practice (and often the first priority before initiating a permit) which involves changing address numbers is not one of superstition but phonetics. The number '4' is not used due to its similarity to the Japanese word "death". The number '3' is favourable because it sounds like the Cantonese word "longevity" and '8' like "prosperity". Lo says numbers such as '9' and '6' are preferred because, when divided by ten, they are "infinite, signifying everlasting life."

A venerable tradition in Chinese architecture is the discipline of feng shui (pronounced Fong Soo-aye, translated as "wind" and "water" and meaning the creation of an environment which supports health, harmony and personal aspirations). Asian immigrants have brought this tradition to Canada and adapted it to create an auspicious design. Feng shui is an ancient wisdom of balancing forces to conserve a building's energy.

Aspects of Feng Shui are often implemented in Oriental homes. Yet, many of its principals are common to most cultures, according to Lo. The discipline encompasses both the exterior and interior design. It affects the layout of the house and the contents of the house, requiring for example that dining tables must be round. Feng Shui masters believe a home's outside door should not open directly to a bedroom because "the devil's spirit is able to attack them while sleeping" yet in the Western world, safety is a concern. "You won't sleep well in either culture," quips Lo.

Certain aspects are very individual, requiring that clients disclose their beliefs early in the design process. He cautions, "Successful businessmen may be reluctant to admit that they are superstitious. On one occasion, the client assured me there was no need for a Feng Shui consultant before creating the floor plan. After completion, he said, 'Just to be on the safe side, I'll consult my Feng Shui master." Another client originally requested a swimming pool, then later refused it, saying it was not safe for the children, but I sensed it was due to Feng Shui."

Kinglsey Lo design in Vancouver, British Columbia (Courtesy Kingsley Lo)

Lo admits to experiencing differences in cultural and business ethics when dealing with clients from Mainland China, Hong Kong and Taiwan. For example, Taiwanese clients prefer older structures and would rather renovate an existing home than rebuild even if costs incurred are equal.

Though he is open to expanding his business abroad, he is cautious. In his experience, clients from Mainland China deal within a network of executives that can be so complex it is not easy to determine whether the representative who says he has the authority to close a deal actually has the authority to fund it. And, thorough research must be completed because variables such as city planning and surrounding of site can drastically change a project in that country.

Lo concludes, "The world is getting smaller with boundaries between East and West becoming less clear. My clients are well travelled and educated in other cultures. In the end, you have to have something unique to offer them, no matter where they're from, to compete."

## 8.6 Conclusions

China and Canada are very different countries in many respects, and their housing experience in particular contrasts markedly. At the same time, Chinese people make a vital contribution to Canadian life and to the Canadian economy, and Canada and China have special links going back for over a century. The Chinese approach to building design is both modern and centuries old. The understanding of human beings and their environment created there has rarely been matched in other countries, and certainly Canada has much to learn from it.

## 9. SOUTH KOREA: ADAPTING IN AN ENVIRONMENT COMMITTED TO MASONRY[30]

### 9.1 The Opportunity

Policies of the current Korean government have focused on increasing the number of new housing units and increasing the density of land used for development. For example, between 1975 and 1995, the proportion of apartments in the total stock increased while that of single and row-houses decreased.

The nation's sustained economic growth from the 1970s to the 1990s was accompanied by improving physical housing conditions across the country. However, the gap between housing conditions in rural and urban areas remains, caused in part by extensive construction of relatively high-quality condominium units in urban areas.

Housing site development projects, as well as construction of estates, are regularly carried out by the South Korea Land Development Corporation. Giant-sized projects (i.e., construction of new towns) aimed at solving the acute housing shortage in the Metropolitan areas were also carried out.

In parallel with the construction of new towns, major urban redevelopment projects are being carried out in existing towns to resolve problems such as environmental contamination caused by the influx of large populations into towns and the urban concentration of diverse functions such as politics, economic activity and culture. Although weak in technology and financing, South Korea has competitive strength through a global physical presence and competitive prices on low technology projects.

To develop its construction activity further, South Korea is in need of advanced and sophisticated foreign technologies. Active international cooperation and technical alliances are expected to be made in the forthcoming years mainly in the technology areas of structure, construction, earthwork and foundation work, architecture, and equipment and facilities.

According to the government's Third National Land Development Plan, the total number of new housing units in demand over the planning period (1992-2001) should amount to 5.9 million units. The ratio of housing investment to GNP ought to be maintained at a level of at least 6.5 to 7 percent annually throughout this period in order to meet the anticipated demand.

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[30] Portions of this Chapter are drawn from *Housing Export Opportunities Series: South Korea* (Ottawa: Canada Mortgage and Housing Corporation, 1997).

South Korea is presently a significant importer of Canadian building materials. Softwood lumber, particle board and medium-density fibreboard are the primary are the primary Canadian exports to the country.

## 9.2 Dominant Technology

South Korea has 12 cities with populations over 400,000 people. Many high-rise apartment buildings and modern houses have been built in Seoul and in other large South Korean cities, but it has been difficult to meet the rapidly rising need for housing, and many people have been forced to live in distant suburbs under poor conditions. Large estates are composed of panel highrise construction.

Most South Koreans, including those in rural areas, live in houses made of brick or concrete blocks, with roofs of cement tiles and slate. Many houses are two or three storeys high, though such houses are less common in rural areas than in the cities. Most houses have ondol floors of thick stone slabs covered by oiled papers or mats. In many homes today, pipes carry heated water under the floors to provide heat. In the cities, many ondols are heated by electric coils. Almost all rural homes also have electricity.

Because of the government's concentration of efforts upon the construction of flats rather than on single homes, terro-concrete dwellings have dominated the market, accounting for as much as 45.7 percent of total dwellings since 1969. Until 1969, slightly less than half of South Korean dwellings were wood-framed. However, the popularity of wood-framed dwellings dropped sharply after 1969 to 4.6 percent.

Wood-frame housing made up less than half of the homes prior to 1969. Since then, an increasing number of households have demanded log-homes, garden type wood framed suburban bungalows, 2x4 Canadian dwellings and other types of wood framed homes including sectional houses. A more affluent middle class wishing to leave the apartment life style for a more suburban one and a significant housing shortage has led to a increasing demand for better housing. The increasing number of old dwellings in need of renovation and housing shortage also sparked government support for housing finance.

It is obvious that the demand for garden houses will continuously increase as the general income level keeps improving in Korea. This means that the demand for wood-framed houses, which are environmentally friendly, will also keep increasing. Supply of wood-framed houses, then will be changed to sub-division type mass production housing constructed by much larger construction companies instead of the small scale contractors who are currently building small quantities by custom orders.

## 9.3 The Challenge of Adaptation

It is imperative that any Canadian doing business in South Korea realize that Seoul is not a North American city. Every year South Korea becomes more and more modern, but it is important to recognize that modern does not equal Western. South Koreans will expect you to be an expert on the nuances of their culture, but they will appreciate a show of interest in matters that are important to them.

Three practices are essential to success in the South Korean market: adapting products and procedures to South Korean tastes and conditions, staying in close communication with South Korean business partners and customers, and consistently exhibiting a firm commitment to the South Korean market. In selling to manufacturers, personal contact is important not only because of the value placed on direct discussion and on building long-term relationships but also because such contact brings the end-user in touch with new processes and equipment.

The process of adapting housing for the Korean market is encountering a number of problems. The supply of construction material is one considering the lack of domestic lumber supplies. Wood framed houses are heavily dependent on imported wood material. Unfortunately, the majority of domestic wood materials are usually unsuitable for construction, and it is expensive to process them.

To boost the current wood-frame construction industry, improvements in technology related to construction are necessary. The low technology level is a natural phenomenon given the short history of importing Western style wood houses. Improving the experience level of the skilled labour and technicians is one of the important steps to be addressed. Currently there is little emphasis on standardizing the level of skills through diploma or licensing programs. Moreover, there are no standard specifications and construction guidelines for installing the ondol system in the second floor. The situation would be further improved by the development of standard design documents for Korean style wood-framed houses built according to Korean life-styles.

## 9.4 Meeting the Challenge: Park/Sanders/Adam/Vikse Architects[31]

In a Korean suburb approximately 10 kilometres from Seoul, the Canadian firm of Park/Sanders/Adam/ Vikse Architects is designing eight houses in a project called Maple Town. The 16 square feet, two-storey building uses energy efficient wood-frame construction. As part of an arrangement to train local labour, only one Canadian carpenter assisted in the assembly.

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[31] This section is based on interviews with Chong Park.

Approximately 70 percent of the material for the housing came from Canada including the wood. The foundation was built with the Quadlock system which uses foam insulation with concrete poured into it. Hardy plank, a non-combustible fibreboard, was used in the siding. Windows with PVC framing, hardwood flooring and other building components also came from Canada.

Canadian housing is considered to be fairly exotic in Korea and has difficulty competing with traditional housing. Moreover, the cost is approximately 25 percent greater, pricing it out of the affordable housing market.

Maple Town houses are a big hit, however, with upper-middle class Koreans who are searching for healthy housing.

A significant selling point for these houses is their "healthy" aspect and the improved air quality. Korean homes typically use cement which is finished in the interior with wall paper. This technique is prone to mildew build-up, to which homeowners usually respond by covering with more wall paper. Canadian drywall alleviates this problem because of its ability to "breath" more readily than cement.

Another attractive feature of the Canadian houses is an in-floor heating system. The boiler with a hydraunic system, has proved immensely popular with the Koreans. Traditionally, floors were heated with the warm air from a wood fire, and Koreans are used to walking about the house in barefeet.

## 9.4 Conclusions

Korea remains an emerging market for Canadian housing technology, though solid headway has been made in recent years. Given the tradition of masonry construction and the large role played by the state in the housing sector, the growing acceptance of wood-frame technology is remarkable. Adaptation strategies can complement this acceptance as Korea comes out of its economic slump over the next several years.

# 10. CHILE: EXPLORING ADAPTATION STRATEGIES IN A NEW MARKET[32]

## 10.1 The Opportunity

Chile is regarded as a promising market because of its strong and stable economy, its outward-looking and international perspective, its growing interest in trade with Canada, its housing needs and demands, and the interest among some groups in wood-frame housing.

Lower interest rates, sustained growth of per capita income, maturation of the home leasing program, and overall improvement in the Chilean economy will drive the building products sector.

Significant growth in new home construction has reduced the persistent housing deficit. Over the last 10 years, new housing construction has averaged 11 percent annual growth while construction as a whole has averaged 8.8 percent growth.

Aside from new home units, a significant increase in renovation and home repairs has stimulated the building products market. A law introducing a new financing alternative (leasing) is expected to increase demand further. Rising per capita income creates demand for better quality and comfort. The renovation and "Do-It-Yourself" (DIY) product subsectors should grow due to the arrival of Home Depot and other U.S. firms as partners of existing large Chilean hardware store chains. As the cost of skilled labour increases, DIY is becoming more popular.

The building products market in Chile is receptive to new and innovative products. The market is segmented, and manufacturers and distributors often specialize in a particular product type. Market prospects appear to be good for the following extensive list of products, services and equipment: oriented strand board; asphalt shingles; vinyl windows and sealed units; vinyl siding; eavestroughing; hardwood flooring; acrylic sinks; bath and shower enclosures; glass fibre and cellulose insulation; fire-resistant gypsum board; materials packages for manufactured housing; synthetic stucco; synthetic stone facing; brick facing, including adhesives; steel studs; wood stains; electric outlet boxes, both plastic and metal; construction equipment, including polyurethane injectors; air staplers and nailers; circular saws; paint sprayers; and stippled ceiling sprayers.

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[32] Portions of this section are drawn from *Housing Export Opportunities Series: Chile* (Ottawa: Canada Mortgage and Housing Corporation, 1997). Other portions are based on a report prepared by Charles Chenard of CMHC's Canadian Housing Export Centre, and on several discussions with Mr. Chenard.

Although wood-frame construction is more prevalent and better accepted in Chile than in other Latin American countries, it is still regarded as housing for poor people by the majority of the Chilean public. There is also a market for site equipment such as compactors and small earth moving machinery.

Representatives of the Chilean housing industry, associations and government have expressed interest in wood-frame housing and in Canadian wood-frame housing capabilities. Although masonry technology is still very strong, the following factors strengthen prospects for the introduction of wood-frame technology:

- The Chile Foundation considers Canadian methods the model to follow in wood-frame technology. The long-term goal of the foundation is to win a major share of the housing market through the introduction of wood-frame construction. To achieve this goal, the Chile Foundation has expressed interest in meeting with Canadian manufactured and modular home builders concerning joint ventures and partnerships;

- Various Chilean home builders are interested in exploring joint ventures with Canadian builders and exporters;\par

- The Wood-frame Builders and Wood Industrialists Association (ACIM) have expressed interest in meeting with Canadian builders concerning joint ventures and business partnerships. ACIM officials are interested in various Canadian technical details and technologies, particularly related to walkup apartments.

- Technical managers of SERVIU (Chile's Ministry of Housing) indicate general acceptance in the long-term of wood-frame construction.

On the other hand, potential obstacles for Canada's housing industry include high transportation costs and the lack of awareness in Chile of Canadian companies and capabilities. However, this is changing with increased Canadian investment in the country.

Canadian companies should consider Chile as a beachhead to other Latin American countries. Chilean companies are exploring export markets and shipping housing materials to Argentina, Costa Rica and Venezuela. Launching Latin American export operations in partnership with Chilean companies that have established the pattern offers great potential for Canadian firms.

Suppliers looking to enter the building products market in Chile should be aware that few standards and regulations are required for building products. Many standards for construction products remain in the development stages. Where a Chilean standard does not currently exist, the customer may demand specific standards.

## 10.2 Dominant Technology

Local construction is dominated by masonry methods. Traditionally, wood-frame construction has been associated with poor peoples' housing, although that philosophy is slowly changing, particularly in the central region.

Housing forms vary with geographic area and available materials. Housing in the northern zone is usually adobe (native clay or a mixture of clay and straw). Features recommended by local authorities include concrete foundations and slab-on-grade, wood doors and windows, and rooting of tar-impregnated cardboard (or mud coated with waterproofing asphaltic emulsions). Guayaquil, a local plant-based fabric, is commonly used for wall and ceiling coverings.

Wood, locally grown and processed, is the typical building material in the southern zone. Concrete and brick are also used, but to a lesser degree. In the south, material economies are different than in the central and northern zones. Wood is local and cheap, concrete and brick must be brought in from other regions; the cost of freight makes the material cost comparatively high. Generally, all interior finishing materials are local. The exceptions are hardware, plumbing and waterproofing materials.

In the central zone, brick and wood are somewhat more plentiful and are used to some extent in place of adobe construction, although adobe remains common. Processed materials (plywood, particle board, drywall) are also available and used to some extent, although the cost is high. Roofs are usually galvanized sheet steel or asbestos tile. These materials may be replaced in the future with ceramic tiles when the region begins its planned production of ceramic tiles. Wood, when used, is often rough-finished treated pine.

## 10.3 The Challenge of Adapting[33]

There is a tendency to over-design structural wood features, principally because the method is still somewhat novel and is approached with greater caution than necessary. The firefighting service in Chile is voluntary.

This is one aspect of the social system that is a detriment to the widespread use of wood-frame construction. The preferred material for exterior cladding is PVC siding, with brick cladding as a second choice. PVC is also preferred for eavestroughs and downspouts.

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[33] This section is based on Holmen Enterprises Limited, *Export Opportunities for Canada's Housing Industry in Latin America*, (Ottawa: Canada Mortgage and Housing Corporation, 1996), p. 66.

In general, materials such as windows, exterior doors, asphalt shingles, ceramic tile, grout and exterior cladding are not available locally.

A typical social housing project is called a progressive house and is similar to Canadian shell housing. The units are two- or three-storey apartments. Interiors are meant to be finished by the purchasers. The cost is roughly $8,000. Another typical social home features 54 square metres on two levels and is generally built for the poorest segment of the populace. The lower level of the home is traditional construction. Two-thirds of it is finished, one-third is to be finished by the purchaser. The upper level is basic wood-frame construction, and roofing is sheet metal. The cost of the unit is $2,500. Subsidies of up to 50 percent are available for social housing.

Many new middle- and upper-income-market homes feature ground-floor construction of traditional masonry, with wood-framed second floors. A typical middle class home is approximately 165m$^2$ in size and sells for $95,000. A typical upper class home sells for $136,000 or more and features 240 m$^2$ of living space. This includes accommodations for a live-in maid. There is significant interest in three- and four-storey walkup apartment construction among private-sector builders.

In urban areas, concrete and masonry housing are the accepted norm throughout Latin America. Wood frame construction is generally better accepted in Chile than in other Latin American countries. Little by little, the traditional association of wood-frame construction with poor people's housing is changing. Many new homes in Chile now feature the use of wood-frame technology, mostly for second-floor and roof construction. This is particularly true in central Chile, the most populated and busiest region of the country where much of the middle and upper market resides.

Historically, wood has been perceived as the "poor-man's" building-material, due to the lack of standardized products and poor quality of the existing products in the Chilean market. However, according to forestry industry statistics, apparent domestic consumption shows sustained annual average growth of 8.1 percent since 1981. In the last five years, the acceleration in usage of wood for construction has become more noticeable. Consumption of wood in the construction and furniture industry has more than tripled in the past three years. More than half of this internal demand--46.1 million cu. feet--consists of parts for housing and other construction, a segment which should continue to grow. Increased demand will be driven by new industry investment, educational campaigns, new products, increased use of wood as finishing material for houses, and better insulation techniques and wood protection methods. Despite 13 percent global market share for U.S. wood products in Chile, industry sources feel potential exists for increased imports of value-added U.S. wood building and construction products, such as windows, doors, parquet panels and redwood products.

Chilean housing project with Canadian technology (Courtesy Lio Marti, CMHC)

The roofing tile and ceramic market represents more than 90 percent of roofing materials, which are mostly made locally. Steel and bituminous roofing materials are just now appearing in the local market. Steel and bituminous roofing materials are used only in new houses, while tile and ceramic roofing materials are used both in old and new homes.

Prefabricated houses have suffered from an image problem in Chile, but demand is growing. Chileans favour brick and cement as construction materials due to the perception that wood homes are not durable enough to last a lifetime. Thus, makers of prefabricated wood buildings who have success in the Chilean market have to offer quality products and flexibility in design.

In the single-family home sector, prefabricated houses traditionally have accounted for an insignificant share of the Chilean market. This market was supplied almost solely by Chilean producers. Prefabricated houses--mostly made of wood--were bought as a cheap alternative for beach or country houses.

Chile has one of the world's most restrictive building codes as far earthquake engineering is concerned. However, no more than 18 percent of building products are subject to standards. Recent consumer rights legislation makes a construction company liable for up to five years for construction or materials failure.

The few Chilean construction regulations are not necessarily more restrictive than U.S. standards, but a wide variety of standards and conventions exist in the building products industry. Products which have received American safety certification, for example, are not automatically qualified for sale in Chile, but could be validated as similar to those applied in Chile.

Environmental and health issues are becoming critical competitive factors in building products. A recurrent theme between manufacturers and suppliers is the environmental friendliness of their products. Water-soluble glues, for example, are rapidly gaining share in the glue and adhesives subsector. Noise pollution is an increasingly important area of concern for regulatory authorities, particularly in Santiago. Chilean regulations relating to the environment abound, but have not been aimed at the construction industry or building materials yet.

Although domestic as well as other foreign country firms are likely to offer stiff competition, U.S. manufacturers of building materials, with their emphasis on design, quality, price and the environment, should enjoy a favourable import climate for their sales in the Chilean market. The Value Added Tax (VAT) is 18 percent on all products and services sold in Chile, foreign or domestic.

In Chile, nearly 1,500 companies are involved in the building industry and employ more than 200,000 people in total. In individual home construction, for example, some 1,000 construction companies build an average of 10 houses per year. No more than 50 constructors build more than 100 houses per year. Renovation and restoration activities are expected to be about 30 percent of the construction market. More than 50 percent of architects are involved in renovation and restoration activities.

Craftsmen and small companies are the largest end-user groups in this sector. Typically, no company holds one percent of the renovation and restoration market. As the housing deficit continues to decrease, renovation and restoration activities are expected to increase 20 percent annually through the year 2000.

In the growing DIY market, end-users are mainly home and apartment owners. There are no known figures or consumer surveys reporting demand of DIY products. However, estimates indicate that more than 250,000 Chilean households undertake DIY work and 30 percent of the population buys DIY products.

### 10.4 Meeting the Challenge: Activities of CMHC's Canadian Housing Export Centre

In March 1998, representatives of the Canadian Mortgage and Housing Association visited Chile for discussions with Chile's Ministry of Housing and Urban Development and meetings with housing organizations and about the Chilean private sector. CMHC representatives signed a Memorandum of Understanding with Chile to facilitate Canadian exports by providing:

- a training program on wood-frame construction to members of the Chilean building industry,
- a study of building codes for wood-frame construction, and
- a feasibility study on doing a demonstration project of wood-frame technology.

Chile has encountered problems with its government-financed low-income houses which suffer from poor quality. In 1997, approximately 30,000 social housing units were heavily damaged by massive water penetration in the Santiago area as a result of torrential rains. This has generated a concern about a lack of strict codes and standards. Chileans are also concerned about issues such as seismic building performance and termite resistance.

Canada's reputation for solid, high quality housing is helping address housing problems. Wood frame can be well suited to earthquake prone areas. There is market for recreational buildings and prefabricated wood-frame houses particularly among the upper-middle to upper-income homeowners. Alternative housing technologies such as structural clay brick are also finding markets in the low-cost housing category.

Driven by government policies that place an increasing reliance on the private sector, access to the construction market is improving. The Chilean Association of Wood-frame Builder and Wood Industrialists also supports Canadian technology market access. However, preference is given to business partnerships or joint ventures, rather than importing Canadian manufactured housing by container.

Market access has also improved under the Canada-Chile Free Trade Agreement. Construction products, with a few exceptions, no longer face an 11 percent tariff in Chile. Remaining tariffs are being phased out over a two year period. The Agreement also prevents Chile from applying any new discriminatory measures to Canadian service providers.

Canadian construction companies are looking to capitalize on the increasing popularity of pre-fabricated housing systems and acceptance of Canadian wood-frame housing technology. Several Canadian construction companies have established joint ventures and are taking advantage of the Chilean wood supply and low labour costs.

## 10.5 Meeting the Challenge: Habitations International[34]

The company of Habitations International, known as Interhabs, takes Nova Scotian lumber and sells it around the world. But first, Interhabs found it paid off to add a little value to Canadian lumber before shipping it. James Snell, the company's founder, recognizes the economic benefit of applying as much value added to its products before they are exported.

Following four years of designing, constructing, and perfecting its pre-built houses for the Canadian market, Snell's major breakthrough came with a contract to Chile in 1979. Snell sold 20 units, using local lumber and transforming it into something of higher value.

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[34] This section is based on the article "Homework: Converting Nova Scotia's timber into durable houses for international markets", by Claudia Pinsent in *Nova Scotia: Open to the World*, Summer 1998, p. 25.

Reducing the cost of labour is one of the big features which make the pre-built timber frame houses sell. The competition in countries such as Germany or Japan tends to have higher labour costs than Canada. Pre-building reduces the time; where it would take 8 months to build a house overseas, it would require only 90 days in Canada.

The company tries to keep in business all year round by working in foreign markets. By taping into the Southern Hemisphere, Snell can obtain contracts to work in January when winter is at its peak in Canada.

Interhab's houses reach markets around the world that include the United States, Argentina, Korea, Germany, Sweden, Denmark, Holland and Scotland. In 1997, these overseas markets produced contracts worth more than $10 million. Operating in a number of different countries also minimizes Interhabs risks that may occur as a result of currency fluctuations and political turmoil.

## 10.6 Meeting the Challenge: Pacific Homes[35]

Mr. Patricio Valenzuela is the president of COVALCO, a large construction company in Chile. COVALCO specializes in commercial institutional and high-rise residential buildings. The Chilean company was very attracted, however, to the quality of Canadian housing products. So much so, that Mr. Valenzuela entered into an agreement with Pacific Homes of British Columbia to build a number of residential units using both wood-frame and light gauge steel construction.

The project has not been an easy venture. Pacific Homes took two years to develop the housing project and meet with people in Chile. In building the homes, Pacific Homes is learning about the concerns of Chilean customers. In some cases, major changes were needed to suit customer preferences. In particular, the size and dimensions of the units were issues. Having dealt with the difficulties of exporting, including consumer acceptance and the economic and political uncertainty in the region, however, the joint venture hopes to complete the project in 1998.

## 10.7 Conclusions

If Canadian firms cannot adapt to the needs of the Chilean market, their prospects elsewhere in Latin America are dim: this is the one most ready for both Canadian commercial contacts and what Canadian housing exporters have to offer. If Canadian companies build a solid reputation in Chile, Argentina and several other markets beckon to them.

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[35] This section is based on information regarding the "Team Canada" mission to Latin America in January of 1998 supplied by DFAIT, and on an interview with the President of Pacific Homes.

# 11. MARKETING CANADIAN LOW-COST HOUSING TECHNOLOGIES

## 11.1 Introduction

Through contacts with various Canadian companies taking part in export-oriented trade shows as well as a literature review, the consultants discovered another strategy for adapting to overseas markets. It is to develop products, technologies and services *specifically suited to international markets alone*, i.e., that may not be marketed within Canada at all.

These companies or in some cases, university-based research centres, are typically targeting the market for low-cost, rapidly-erected forms of housing suited for warmer climates, as either permanent or emergency shelter. Some may have technologies that have not achieved widespread use within Canada but that appear to have better chances of success elsewhere. Examples are alternative methods of building walls to conventional wood-frame of steel-frame, such as insulated concrete forms, polymer forms for concrete, cement-earth mixtures, and straw-bale or compressed fibre.

With a few notable exceptions, Canadian companies pursuing the third strategy appear to be having modest success at present, at least measured in volume of sales in foreign markets. In many cases, they may lack the size and capital to introduce and follow through in challenging circumstances. In some cases, local economies in developing countries simply cannot support any form of imported goods and services for low-income households.

Chances for improving export prospects for low-cost housing suppliers appear to rest with *technology transfer* to companies and users in target markets receiving financing from the United Nations or from International Financial Institutions such as the World Bank and the Inter-American Development Bank.

In this Chapter, we present a selection of Canadian-sponsored efforts at fundamental adaptation to low-cost housing needs, ranging from university-based Research & Development projects to technology transfer ventures, to products routinely shipped from Canada.

## 11.2 "Habitech Centre", Thailand[36]

The "Habitech Centre" was the result of a bilateral project in Southeast Asia financed by the Canadian International Development Agency.

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[36] This section is based on information supplied directly by Professor Bernard Lefebvre of the Asian Institute of Technology (AIT) in Bangkok, and on materials supplied on the AIT Web site.

Executing agency for the project was the "Canadian Universities Consortium", working with the Asian Institute of Technology (AIT) in Bangkok, Thailand on a broader "Urban Environmental Management Program" in the region.[37] This program sought to produce a cadre of urban planning professionals trained and committed to an integrated approach to planning and development.

One of the major successes of the program was development of the "Self-Contained Housing Delivery System (SCHDS)". Under the direction of Prof. Bernard Lefebvre of the University of Calgary, "Habitech" developed and transferred the SCHDS to produce more than 70 housing and infrastructure projects in 12 Asian countries including, Thailand, Vietnam, Burma, Cambodia, Laos, Sri Lanka, Papua New Guinea, Nepal, Malaysia, the Philippines and Indonesia.

SCHDS components can be arranged into different configurations. Components of the system include interlocking soil-cement bricks, joists, floors, roofs, doors and windows, foundation, staircases and a sanitary system. A key feature of the system is the use of an interlocking soil-cement brick which can be produced with a modified moulding machine. While unskilled labour may be used to produce these bricks, some degree of skill is required to place the bricks when building walls. A project in Thailand built ten middle-income houses with floor areas of 72 square metres and were sold on the market for an average price of $20,000 each. A principal result of the system is a market for small scale building materials firms geared to the specific housing demand and supply conditions in the project area.

In 1994, the Habitech Centre was awarded the Matsushita Memorial Prize by the Japan Housing Association "in recognition of excellent achievements in improving human settlements in Asian countries by promoting research and development related to technologies for low-cost housing as well as providing educational programs and facilities to disseminate the results of their research efforts." One of Habitech's projects was also selected as a finalists for the World Habitat Awards 1995 of the Building and Social Housing Foundation in the category for developing countries. The Self-Contained Housing Delivery System was also nominated as a "Best Practice" for Habitat II, the United Nations Conference on Human Settlements in 1996.

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[37] The Canadian Universities Consortium includes the University of Calgary, the University of British Columbia, Waterloo University, York University and more recently the University of Montreal. The University of Calgary chairs the consortium. This section of the report is based on the Asian Institute of Technology Website and on information provided directly by Professor Lefebvre.

## 11.3 "Aranya Project", Indore, India[38]

The city of Indore in India's Madhya Pradesh province used an innovative building technology developed by the McGill University Minimum Cost Housing Group and the Vastu Shilpa Foundation of India. The resulting "Aranya" project altered both site services and building design and technology to fit in with traditional culture and current urban health and safety requirements. Aranya, a mixed-income township with serviced plots for lower-income households, was underpinned by a study published under the title *How the other half builds*. The study ascertained the use of space and the priorities of the slum dwellers in Indore.

This "site and services" project discarded many of the conventional architectural, planning and engineering approaches in preference to appropriate and often highly innovative solutions. Distinctive features included a very clear organisational hierarchy of plots, spaces and activities, imaginative clustering, efficient land use and a high standard of utilities within severe budgetary constraints.

In the "site and services" approach, each family is provided with a small plot which is provided with a water tap, storm-water drainage, a sewerage connection and a paved access with street lighting. The level of servicing varies with the beneficiaries' ability to pay. This approach has various advantages over conventional housing. The cost is less and hence more households can be covered with the same resources. Such projects can address needs of very low income groups without large subsidies, which in turn, reduces the financial burden on public agencies. This approach incorporates the concept of progressive development of services and facilities, depending on the resource availability and growth of the settlement. It allows people to undertake incremental housing construction at a speed that matches their needs and ability to generate resources. The houses are designed by people themselves to suit individual needs rather than producing "standard" units provided to each household in ready-build housing schemes.

The Aranya settlement was conceived as an agglomeration of six self-contained neighbourhoods. For identity, access, equity and cohesive functioning, the commercial, community and recreational amenities required for all were located in a linear spine in the centre of the settlement, while convenient shops and other neighbourhood facilities were dispersed to be accessible in walking distance.

Most of the building plots were small and permitted only row-house development. The longer side of a block of row houses was given a north-south orientation to reduce the solar radiation on the building facades. This orientation necessitated the lower level

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[38] This section is based on information supplied by the McGill University School of Architecture and by the Vastu Shilpa Foundation Web site.

The build form was compact, low rise with internal court yards and similar in principal to traditional towns. A service core was provided in each plot and the location of the service core was most carefully considered in terms of user's socio-cultural preferences. A system of clustering was adopted which avoided toilets at the front of the house, while at the same time saving on cost and performance. Clusters of 8 to 10 dwellings were grouped around a small semi-private space which could also be used to link services to each plot. The service cores in the rear courtyard combined in multiples of two and four and discharged individually into gully traps, with an inspection chamber in each service slot. This network in turn was linked to the street service lines, which were halved in number as only alternate streets would need service lines.

One of the greatest challenges in mass housing is to offer choices in form through flexibility of design. At Aranya, variations in entrances, staircases, verandas balconies and fenestration within the standard layout help each house gain a unique character. These variations not only enrich street facade but also help users express their identity.

The Aranya project has been specifically recognized as a model development by the World Bank and has also received international acclaim as a good example of close collaboration and co-ordination among various agencies.

## 11.4 Examples of Canadian Commercial Low-Cost Housing Technologies

In the following pages, various Canadian low-cost housing technologies are profiled in more detail, with specific information on how they seek to adapt to conditions in developing and transitional economies.

### 11.4.1 "Royal Building System"

The Royal Building System uses concrete-filled modular polymer (polyvinyl chloride) components. The hollow interlocking panels and connectors slide together to form walls and roofs and are then filled with concrete. The system reduces equipment requirements, construction time, and costs with its modular approach. It is designed to produce units of modest size very quickly.

The suppliers claim the system has several advantages over conventional building systems including: ease of construction; durability; resistance to earthquakes and hurricanes; low maintenance; and energy efficiency. It is claimed to be appropriate for all types of climatic conditions, from extreme heat to extreme cold. It is also resistant to deterioration from rust, rot and vermin infestation. The building system is sold through a distributor network in over 40 countries worldwide. End users range from single family home owners to large multi-national corporations. Local production plants are currently being put into operation in China.

### 11.4.2 "Digigraph System"

Somewhat similar to the Royal Building System is that offered by Digigraph, a smaller company based in Quebec. It also uses sliding polymer forms filled with cement on site, although these are composed of more elements than the Royal Building System. Its producers claim it to be quick to build, durable, easy to maintain, fire-proof and termite proof.

Construction starts with laying a sill plate on a concrete slab. Next, scaffolding is erected to provide temporary wall support until the wall components can be assembled. Concrete is poured into the wall components and into the roof after it is installed. The house is completed by installing doors and windows that fit snugly into place.

Digigraph components are light and stackable for ease and economy of transportation. The producers argue that the system is sufficiently flexible to build homes of any size to fit individual needs. With the system, it is possible to build houses, retaining walls, and small one- or two-storey buildings. Digigraph is a small company based in the Montreal region.

### 11.4.3 "Blue Maxx" System

The Blue Maxx Wall system is a polystyrene wall-forming system into which cement is poured. The interlocking, stacking form units consist of two flame-resistant panels of expanded polystyrene enclosing a cavity between them. Each panel measures one metre by half a metre. They are linked together using a patented locking mechanism that ensures a proper vapour barrier and water proofing. Reenforcing bars can be placed where necessary to satisfy strength requirements for below- and above-grade load bearing walls, beams, lintels, and shear walls. The technology is claimed to be suitable for a wide range of applications including low-cost housing, higher-end housing, schools, clinics, hotels, and other low-to-medium rise buildings.

Blue Maxx stacking units allow for speedy installation and are claimed to reduce labour costs. The producers argue that the system provides the least expensive method for constructing an R-2000, Advanced House or any energy-efficient home project, because most requirements of these programs are automatically incorporated into the building envelope with no extra cost. The manufacturing and construction process is environmentally friendly, and relatively simple, and produces a fire-retardant structure. Extra strips can be added to take drywall nails and other fittings, allowing flexibility of assembly and design. The concrete is poured and hardens in an protected environment, helping to extend the building season year-round, even in wet climates. Polystyrene also acts as a very good insulator for both warm and cold climates.

AAB Building Systems developed this building system and began distributing it in the early 1990s. Its products are manufactured in seven facilities across North America and are available in all States and Provinces and in every major market in the U.S. and Canada. Internationally, Blue Maxx has projects in place or in progress in Japan, Russia, the Czech Republic, and various Caribbean nations.

### 11.4.4 "Sparlock" System

This is a wall system of mortarless interlocking concrete blocks producing both load-bearing structure and finish. Exterior facing blocks can be separated from interior facing blocks by a space between them, which can then be filled with insulation such as polyurethane foam. This system offers an innovative use of concrete without mortar which reduces the costs of erection. The system is currently being applied in South Africa. Les Produits Sparbéton Ltée is a small company headquartered in Montreal.

### 11.4.5 Interlocking Concrete Module System

Teron Incorporated developed and patented two modular concrete construction technologies to produce Canadian-quality buildings using local labour and materials for a wide variety of individual designs. The Residential Building Technology is for single-family houses, linked houses, low-rise and high-rise apartment buildings and hotels. The Commercial Building Technology is for office buildings, retail stores, industrial and public buildings and schools. It produces multi-purpose, pre-finished components for the structure, with very high quality pre-finished interiors.

The Teron technology is claimed to use significantly less materials and labour per square metre of building, and to simplify the total building process. These savings can be used to reduce costs or to add more insulation, better kitchens, bathrooms, energy efficient heating systems and controls, etc. Moreover, the producers argue that the technology adjusts to conform to each locality's current engineering standards.

In 1993, Teron International signed a Protocol with the Federation of Russia to make its patented building technology available to Russian building enterprises to increase their variety, quality and productivity by upgrading their current housing factories to produce Canadian quality housing using their current labour force and local materials. The system is currently being used in St. Petersburg, Russia. It has also been applied in South Africa.

### 11.4.7 Steel-frame Housing With Fibre-cement And Gypsum Board Walls

Les Distributions Gypco, headquartered in the Montreal region, offers a framing system that uses steel studs in place of wood, to which gypsum board and fibre-cement board sheathing are fastened. This construction system is claimed to be more durable and lighter than wood, as well as being vermin, termite and fire proof. It is said to be easy to transport and adaptable to all interior and exterior wall and roofing materials. It is suitable for a variety of climatic conditions. It is easily adapted to a variety of climatic conditions and particularly well-suited to areas of the world were wood is scarce and expensive. The system is currently being sold in Bolivia.

### 11.4.8 "Seven S" Oriented Strandboard (OSB) Insulated Panel System

This construction system uses insulated panels composed of polyurethane and oriented strandboard (OSB) constructed of hardwood wafers, bonded with resins. The construction system comprises a fully insulated stressed. The standard wall panels are eight feet high, and are available in standard two, four, eight or 12 feet widths. Roof and floor panels are also featured, using the same resource-efficient structure. This system can be assembled quickly on site to form walls, roofs and floors. Components and materials are easy to ship.

The building materials are fire, moisture, termite and rodent-resistant. As well, the completed structures are hurricane resistant. The building system meets and exceeds all the requirements of the R-2000 construction standards, while creating additional interior space.

The basic system has been used in a variety of international markets. Recent modifications to use knock-down elements of OSB have not been widely applied to date. Several companies are involved in supplying the Seven-S system and also in developing variations on the theme.

### 11.4.9 "Durakit Shelters" Corrugated Fibreboard Housing System

DuraKit Shelters manufactures quick-erect houses which can be shipped anywhere in the world at low cost, due to its light weight and compact kit system. Typical configurations range from 200 sq. ft. cabins to 400 and 600 sq. ft. houses and utility buildings. All are built to allow erection by two or three unskilled workers in a day or two. The primary building material is a special corrugated fibreboard. This material is factory-coated and treated to make a durable house which has a fireproof interior, weatherproof exterior and a structural integrity which can withstand high winds and snow loads higher than prescribed in the Building Code for Northern Ontario, Canada.

Extensive product qualification and testing has been done, and continues to be performed by the renowned Civil Engineering Department at the University of Western Ontario and with its partner, The Boundary Layer Wind Tunnel Laboratory. This effort has been supported by the National Research Council of Canada.

Norampac Inc. which was formed by the merger of divisions of Domtar Inc. and Cascades Inc., is a leading North American supplier of corrugated cardboard. In an exclusive partnership with DuraKit, and in cooperation with the University of Western Ontario, they have created a custom fibreboard which maximises the use of recycled fibres while maintaining optimum strength. They are also custom producing a board for DuraKit which incorporates treatments for fire retardation and moisture repellance.

DuraKit's factory-applied exterior coatings include a fire retardant stucco finish which can be painted and repaired in the traditional manner. Other finishes include a flexible vinyl-fibreglass hybrid and a premium ceramic coating option which is so tough that it can withstand vigorous hammer blows with no damage. Interior coatings include flameproof firecoat and a plaster coating.

Windows and doors are good quality North American standard products. Plumbing, heating and electrical options have been selected and are available to complement the low cost and compact profile of the DuraKit system.

### 11.4.11 "Dry-pack" Waste Fibre Housing System

This construction method uses waste fibre such as shredded wood, bagasse, elephant grass, agape, or chopped straw, "dry-packed" into building blocks, stacked to form a wall which is structurally and finally completed with "skins" of fibre-polymer or cementitious materials. Arched roof structures can be engineered somewhat similarly; R&D is underway. The blocks are enveloped in tensioned polymer mesh, serving to reinforce and tie in the skins so that even soil cements and adobes can be used for the walls. "Proof of concept" engineering development and structural testing was conducted with support from CMHC under its Housing Technology Incentives Program.

The unique Dry-Pack system offers much of the same advantages of its forerunner, stuccoed straw bale wall construction, and more. Its use of short-strand fibrous and other polymeric wastes of industry and agriculture offers intrinsically low cost, environmental benefit and true sustainability with vast scope. Like the straw bale, there's no need for refining, heating, or resins in producing the blocks, so there's none of the energy consumption and polluting effects these entail. The tensioned mesh allows the use of lower quality stuccoes or adobes. The wall is much thinner (30 cm) than straw bale construction, gaining space and cutting ancillary costs still further.

The design is well conceived to provide tie-down and overall resistance to hurricane forces, as lab tested, and is readily geared for earthquake regions too. Energy efficiency is very high; maintenance costs can be very low.

Following the pilot development and structural testing, a second generation "blockmaker" machine has been manufactured and a prototype house built (using shredded wood from mill wastes and roadside brush). The durability assurance of the new Dry-Pack system borrows from the hundred year experience of the Nebraska straw bale houses, materially similar.

Internatural Building Systems Inc. develops and promotes "dry-pack" housing based on a broad spectrum of organic fibre and other polymeric wastes. It's engineering base includes Fibrehouse partners, and it seeks business and building partners wherever affordable housing is a priority. Fibrehouse Limited is a three-year-old architectural/engineering company developing "dry-pack" composite housing technologies "for people and the planet", including the above and the next technology. R&D continues into dry-pack block roofs to encompass the whole house shell.

### 11.4.12 Concrete Forming System Erected Without Cranes

As noted above, Mascon Engineering Limited has developed a construction method using poured-in-place concrete formed with aluminum panels fabricated by the hundreds, using a repetitive design. The method forms all the concrete in a building such as walls, columns, stairs, and balconies, in exact accordance with the architect's design. The largest forming panels weigh under 30 kilograms. Panels and other sections are secured and fixed by steel pins and wedges with spacer ties.

The only tool required for assembling and dismantling the forms is a hammer. It is suited to both low-rise and high-rise construction. The aluminum forms can be erected by unskilled labour and without need for cranes. The forming system is fast, simple, adaptable and very cost effective. By using aluminum, the forming system is more environmentally friendly than some traditional construction systems. The forms are readily recycled.

Conceived in the late 1970s in Canada, the MASCON system for low-cost housing has found its way to several Asia Pacific economies as well as in the Middle East. The system is used in Iraq, Malaysia, Chinese Taipei, Thailand, and Hong Kong, China with great success. MASCON also won a CMHC competition for low-cost housing technology to be used in China, but the project did not proceed for reasons unrelated to the technology.

## 11.5 Conclusion

Canadian-based firms and non-governmental organizations have developed a number of significant innovations in both site services and housing construction technologies which qualify as "low-cost". In many countries with transitional or developing economies, "low-cost" could be defined as fully-serviced dwellings affordable by those earning annual incomes of under US$ 3,000 and/or capable of being constructed for less than US$ 15,000 per unit.

Canadian producers of these innovative technologies have attempted to bring costs down in a variety of ways: relying on clever use of local raw materials and labour; reducing the need for expensive heavy equipment; reducing the size of dwellings produced; increasing the speed of construction compared to conventional methods; promoting self-help by prospective occupants; and simplifying both technologies and materials.

Despite the huge demand for low-cost housing and site services around the world, relatively few Canadian firms have succeeded in securing large-volume production contracts. Most suppliers operate at the margins of conventional technology in the various markets. Many have been unable to break through the conservatism of regulatory officials, consumers, or financial institutions, despite the pressing needs.

# 12. LOOKING TO THE FUTURE: LINKING INNOVATION AND ADAPTATION

## 12.1 Major Options for Future Adaptation

In expanding markets for individual Canadian products and services, as well as for the "Canadian housing system", there appears to be scope for increasing acceptance in other countries for what Canada already has. Canadian firms would continue to focus on the frame building system, on niches within established major markets such as the United States, and on comparatively new markets such as Germany.

On a complementary track, however, it is also feasible to reduce technical, consumer acceptance, and trade barriers to Canadian housing exports through various amounts of adaptation. This may mean making strategic, relatively low-cost modifications to design, composition, and performance of "standard" Canadian housing. It may extend to devising substantial changes to mimic conventional technologies of other countries with Canadian frame systems. Firms may also continue to explore markets for low-cost housing systems not used in Canada but potentially applicable elsewhere.

In the future, foreign private sector companies and government research institutes may become even more engaged in "co-evolving" work on an indigenous version of Canadian building technology, unique to the circumstances and needs of the host country. For example, there ongoing exchanges on energy-efficient housing with Japanese companies and government bodies. These may be copied in countries such as Germany, Poland, Taiwan and Korea. CIDA is also becoming involved, along with CMHC, in pro-active housing technology transfer efforts, notably in Russia. It is not difficult to imagine similar efforts in other countries of the former Soviet Union or in northern China.

## A TEN-POINT INNOVATION CHECKLIST

**Section One: Assessing Your Product**

1. Assessing the Competition
2. Assessing Performance
3. Researching Certification Requirements
4. Conducting Field Testing
5. Considering Environmental Impact
6. Investigating Patent Protection
7. Considering Manufacturing Complexities
8. Estimating Investment Requirements
9. Surveying Consumer Reaction
10. Predicting Profitability

**Section Two: Developing a Business Plan**

1. The Business Plan
2. Steps in Product Development
3. Product Development Case Studies
4. Estimating Development Costs
5. Speed Counts

**Section Three: Entering the Marketplace**

It remains to be seen whether Canadian-developed "low-cost" housing systems can be successful in many foreign markets without substantial subsidies, either to foreign buyers, or to the Canadian companies themselves. It would appear that they need to focus their efforts mainly on creating ventures in other countries to act as champions for what they sell.

## DRIVERS OF ADAPTATION AND CANADIAN RESPONSES

| MARKET | DRIVERS OF ADAPTATION | MAIN EMPHASIS OF CANADIAN EFFORTS | FUTURE DIRECTIONS |
|---|---|---|---|
| United States | Focus on energy and environmental factors, coupled with competition for market share | Transfer of Canadian R-2000 technology | Development of niche markets within whole. |
| Germany | Preference for masonry construction, coupled with need for rapid expansion of better quality housing | Meet German building codes and product standards with Canadian wood-frame technology | Shift to single-family, two-family and town houses; renovation of existing high rises |
| Japan | High cost of labour, coupled with lack of indigenous materials and preference for traditional housing | Seek changes to Japanese building codes and product standards, train Japanese builders and inspectors | Continue training in Canadian construction techniques, emphasis on high quality materials |
| Korea | Desire for alternatives to high-rise apartments, coupled with economic difficulty | Reform Korean building codes; train Koreans in wood frame construction | Development of secondary mortgage market system |
| Russia | Large backlog of housing need, coupled with privatization of housing industry and demand for energy efficiency | Seek regional support of wood-frame construction system; train Russians in construction techniques | Inclusion of the Canadian wood-frame system in the Russian building code |
| China | Large backlog of housing need, coupled with privatization of housing industry and environmental limits on indigenous materials | Meet Chinese need for low-cost housing technology with systems to reduce costs and use of local labour | Emphasis on quality and efficiency of construction to meet growing demand |
| Chile | Substantial housing need, coupled with forest resources and history of European masonry construction | Develop ties with Chilean wood-frame industry to build reliable supply of dry lumber | Encourage adoption of Canadian standards for wood-frame construction |

## 12.2 Selecting Among Options for Adaptation

Immediate conditions and long-term economic, social, environmental and cultural circumstances within which housing and community infrastructure technologies are selected vary immensely around the world. It is essential to carry out careful market research on site prior to making commitments to significant product or service adaptation.

# QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS RELATING TO MATERIALS, COMPONENTS, AND SYSTEMS ADAPTATION

| ASPECT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 1. Market entry | Have you done a careful market analysis in advance of exporting to this country? | | |
| | Do you have a partner or other contacts in the target country to advise on compliance with market and regulatory requirements? | | |
| | Would it make sense for you to design and make a specific product exclusively for export to the target market? | | |
| | Have you personally visited the target market? | | |
| | Are there trade shows and similar events where both local products and international competition can be assessed quickly? | | |
| 2. Marketing | Do you consider your company to be engaged in or a part of exporting a complete housing system? | | |
| | Does your product/system have demonstrated advantages over those already offered market? | | |
| | Do you try to communicate in the language of the country to which you are exporting? | | |
| | Is your literature translated into the language(s) appropriate to the target market? | | |
| | Are you able to make it easier for a customer to do business with you rather than your competitors? | | |
| | Are you making effective use of commercial assistance from government and industry associations? | | |
| | Can you offer housing products or systems made to measure, i.e., according to client plans and specifications? | | |
| | Are you able to distinguish the your product or system from local/foreign competitor products through features such as enhanced healthfulness, energy efficiency or environmental performance? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS RELATING TO PRODUCT, SYSTEM AND TECHNOLOGY ADAPTATION (CONTINUED)

| ASPECT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 3. Standards and quality assurance | Do you know what customer expectations about quality of building products are? | | |
| | Are your product or system design and standard dimensions adapted, as needed, to the metric system? | | |
| | Are provisions for fire protection based on local experience and planning norms? | | |
| | Are you considering requirements for earthquake, flood and climate protection beyond those of Canada? | | |
| | Is your product or system flexible enough to conform to the unique norms of the recipient market? | | |
| | Have you considered design requirements and customer preferences for dwelling styles and room sizes? | | |
| | Is energy efficiency as important in the target market as it is in Canada? | | |
| | Have you made efforts to get local architects and inspectors on side? | | |
| | Is your product or system closely aligned with the technical experience and orientation of local builders or contractors? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS RELATING TO MATERIALS, COMPONENTS, AND SYSTEMS ADAPTATION (CONTINUED)

| ASPECT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 4. Financing and commercial viability | Is it commercially viable to make different versions of your product or system for domestic and export markets, and/or for different export markets? | | |
| | Have you assessed costs and benefits of a foreign subsidiary to produce adapted products or systems? | | |
| | Can you meet price competition without compromising on quality? | | |
| | Can you readily calculate the volume of production required in order for a product to be redesigned to suit the specific market? | | |
| | Does the end price of your product relate well to the incomes of the target population in the foreign market? | | |
| | Are financing/insurance available to help underwrite risks of introducing your product to the market? | | |
| | Do you aim at supplying government housing projects, so that your product or system can be afforded? | | |
| | Have you considered systematically risk factors in both venture development and housing loan financing? | | |
| | Have you settled on satisfactory terms of payment? | | |
| 5. Design | Do you believe quality of design is important enough to secure professional design advice geared to export market requirements? | | |
| | Can you incorporate traditional or vernacular design of a target market into your product or system? | | |
| | Do you offer exterior and interior finishes to suit the target market? | | |
| | Can you readily manufacture or build your product/ system to different size specifications? | | |
| | Can you readily change colours offered to match customer preferences? | | |
| | Can you modify installation systems to suit local capabilities and circumstances? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS RELATING TO MATERIALS, COMPONENTS, AND SYSTEMS ADAPTATION (CONTINUED)

| ASPECT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 6. Customer service | Have you considered perceptions that customers in the target market have of "good housing"? | | |
| | Do you provide more detailed instructions than you would in Canada? | | |
| | Do you provide extra materials in the event there are incidents involving losses, improper usage, etc.? | | |
| | Do you offer Canadian tradespeople to carry out specific tasks and/or to train and guide local workers? | | |
| | Do you offer training to local builders, tradespeople and/or maintenance workers? | | |
| | Can you readily accommodate requests for partial or complete systems if a customer asks? | | |
| | Do you offer warranties on your products or systems? | | |
| 7. Innovation | Do you have regular communication to track trends in the market? | | |
| | Have you learned things from international exports of your product or system that can be applied closer to home? | | |

Once a fundamental market assessment has been done at the level of the questions posed above, it will be feasible to consider options for adaptation.

There are three further qualifying questions to help determine the most appropriate adaptation strategy:

- Can your product or service be used in or with most or all other housing systems, including frame, solid masonry, post-and-beam, poured-in-place concrete, etc.?
- Is your product or service essentially dependent on and geared to frame housing systems, whether in low-rise or high-rise form?
- Is your product or service essentially geared to the market for "low-cost" technology?

Note that in some cases, such as lumber, adhesives, insulation, heating systems or surface coatings, there could be opportunities in all three types of recipient markets, though adaptations required may be modest in at least the first two types.

Depending on the answers to these questions, current and prospective exporters can choose one of three lists of adaptation questions presented below in Annex "A":

- The first offers tips on how to adapt modestly existing Canadian products, services, and building systems to foreign markets. Some such as those in the United States, Australasia and Scandivavia already use frame technology, for example. "Modest" adaptations are those of element design, colour, style, and other features which are typically offered to a range of North American consumers in any case.

- The second list of questions offers considerations relating to significant adaptation of both carriage trade and affordable housing using Canadian frame or other light-building technologies. The focus is on markets much more accustomed to other technologies such as post-and-beam construction or solid masonry, e.g., Japan, Germany, Russia, Chile, Korea. "Significant" adaptations are those affecting the whole house design and technology, the materials used for cladding, standards of construction, selection of heating system, etc.

- The third list relates to marketing of low-cost housing technologies in developing and transitional economies, either directly, or to International Financial Institutions or international development agencies, e.g., China. In this case adaptation may include types of materials used, selection of technology for transfer, etc.

The contents of the lists of questions come from two main sources:

- interviews and focus group sessions with Canadian housing exporters.
- the authors' own visits to trade shows, foreign markets, and direct exporting experience.

## 12.3 Conclusion

Experienced housing exporters are *already strongly committed to and acting on the idea of adapting what they sell* in foreign markets. They alter design, colour, finishing, quality, performance, dimensions, language of literature or other features, in some cases substantially. However, more needs to be done to facilitate exchanges of practical information on this topic among current and prospective exporters, resulting in significant gains in Canadian export success.

Against Canada's very able competitors in international housing markets, every marketing tool that can be created for Canadian firms is needed. Advantages to be gained over other *Canadian* firms by clutching best practices in many foreign markets are fleeting, if they exist at all. While there are obviously some proprietary technologies and products and commercial-confidential "tricks of the trade", most product and service adaptations are readily evident from published company literature. The potential market is often so vast that there is plenty of room for everyone from Canada, despite possible perceptions to the contrary.

## ADAPTATION POTENTIAL: TOP HOUSING-RELATED EXPORTS, 1998

| PRODUCT | ADAPTATION POTENTIAL |
|---|---|
| Standard softwood lumber ($11.114 billion) | Adaptable to post-and-beam system. Export quality selection. Encourage users to accept wood-frame. |
| Waferboard/particle board ($1.657 billion) | Can modify sizes of sheets and composition of glues. |
| Wooden joinery, carpentry ($0.789 billion) | Can modify designs, woods used. |
| Hardwood lumber ($0.518 billion) | Can modify dimensions. |
| Prefabricated buildings ($0.377 billion) | Extensive modifications possible. |
| Ethylene film and sheet ($0.305 billion) | Very limited: size, thickness of sheets. |
| Wood shingles and shakes ($0.298 billion) | Very limited: colour, shape, treatment. |
| Hardwood veneer ($0.295 billion) | Limited: colour, finish. |
| Portland cement ($0.258 billion) | Very limited: packaging and colour only. |
| Shaped softwood lumber ($0.255 billion) | Extensive design varieties feasible. |
| Wallpaper, plastic ($0.242 billion) | Extensive design and colour variation feasible. |
| Parts of cranes, machinery ($0.234 billion) | Depends on models used abroad. |
| Plaster board ($0.226 billion) | Very limited: size of sheets, thickness. |
| Builders' wares of plastics ($0.216 billion) | Design variations feasible. |
| Hinges of base metal ($0.212 billion) | Limited: size, design, colour. |
| Softwood plywood, <6mm ($0.206 billion) | Very limited: size of sheets, quality. |
| Wood doors, frames, etc. ($0.196 billion) | Limited design, colour, size variations feasible. |
| Film and sheet of plastics ($0.181 billion) | Very limited: size, thickness. |
| Tufted carpets, nylon, etc. ($0.167 billion) | Extensive design, colour variations feasible. |
| Front-end shovel loaders ($0.164 billion) | Depends on models used abroad. |
| Vinyl interior coverings ($0.140 billion) | Extensive design, colour variations feasible. |
| Graders/levellers ($0.120 billion) | Some size and design variations feasible. |
| Air conditioning parts (.115 billion) | Depends on models used abroad. |
| Burglar or fire alarms, etc. (.114 billion) | Limited design, electrical system, and application variations feasible (e.g., to solid masonry structures). |
| Metal mountings for buildings (.114 billion) | Design, colour, and strength variations feasible. |
| Electrical plugs and sockets ($0.112 billion) | Can be 110 or 220 volts, with design variations. |
| Apparatus: switching circuits ($0.111 billion) | Can be 110 or 220 volts, with design variations. |

## ANNEX "A": QUESTIONS POSED BY EXPERIENCED EXPORTERS

### QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN ADAPTING TO HOUSING TECHNOLOGIES OTHERS USE

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 1. Community planning | Are subdivisions laid out the way they are in Canada?<br>What is the preferred density for each type of housing?<br>Can lower-density developments using frame systems readily be integrated with existing settlements? | | |
| 2. Site services | Can Canadian components be readily used with local site services?<br>Are site services normally supplied before dwellings are constructed?<br>If site services are supplied after housing construction, can you make provision for this in supplying your product? | | |
| 3. Home design | Does your product adapt readily to favoured home designs associated with solid masonry or post-and-beam construction?<br>Does your product mimic heavier construction elements with less material content and hence lower cost and faster construction?<br>Are your product or system design and standard dimensions adapted to the metric system? | | |
| 4. Foundations | Do dwellings normally have foundations?<br>Are people accustomed to using basements as additional living space?<br>Are there innovations in foundation systems that your company can introduce? | | |
| 5. Structural elements | Does your product adapt readily to use with solid masonry walls?<br>Does your target market demand a higher standard of lumber than is typically used in Canada? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN ADAPTING TO HOUSING TECHNOLOGIES OTHERS USE (CONTINUED)

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 6. Exterior envelope | Does your product adapt readily to use with solid masonry walls?<br>Is it necessary to take precautions with windows are to withstand moisture penetration from storms?<br>Can you adapt window sizes to customer requirements in your target market?<br>Do you need to upgrade energy performance of windows to low-emission glass?<br>Do customers consider wooden windows to be preferable to vinyl?<br>Are tilt-and-turn windows the norm?<br>Are there security bars or grills on windows as a standard feature?<br>Do you offer exterior finishes to suit the market? | | |
| 7. Roofing | Is the normal roofing ceramic tile?<br>Can you introduce shakes or shingles to the target market? | | |
| 8. Interior spaces | Does your product adapt readily to use with solid masonry walls?<br>Are standards for staircases the same as in Canada or steeper?<br>Do you offer interior finishes to suit the market? | | |
| 9. Interior fixtures | Are counter top heights the same as in Canada?<br>Do cabinets need to be specially protected against insects?<br>Are built-in closets to norm in the target market? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN ADAPTING TO HOUSING TECHNOLOGIES OTHERS USE (CONTINUED)

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 10. Plumbing, etc. | Does your product adapt readily to use with solid masonry walls?<br>Are there innovations in plumbing such as plastic pipe that you can introduce to the target market?<br>Is there a problem of chemicals in the local water which accelerate corrosion or deposits in water lines? | | |
| 11. Heating, ventilation | Are hydronic heating systems the norm?<br>Is ventilation equipment put in finished areas of the dwelling, necessitating a finished appearance? | | |
| 12. Electrical systems | Does your product adapt readily to use with 220 volt systems?<br>Do you need to pre-drill for electrical services?<br>Are plugs placed in the walls in essentially the same locations as in Canada? | | |
| 13. Manufacturing equip. | Does your product adapt readily to the prevailing industrial power system?<br>Do workers require retraining to use your product?<br>Does your product readily mesh with machinery and equipment from various other sources? | | |
| 14. Construction equip. | Does your product readily mesh with machinery and equipment from various other sources?<br>Do workers require retraining to use your product?<br>Are there safety features of your product that set it apart from competing ones in the target market? | | |
| 15. Power, hand tools | Does your product adapt readily to use with 220 volt systems?<br>Do workers require retraining to use your product?<br>Are there safety features of your product that set it apart from competing ones in the target market? | | |

### QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN

## PROMOTING THE "CANADIAN HOUSING SYSTEM" IN COUNTRIES USED TO SOLID MASONRY, POST-AND-BEAM, OR OTHER SYSTEMS

| ELEMENT | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 1. Community planning | Are subdivisions laid out the way they are in Canada? | | |
| | Are preferred densities higher than in Canada? | | |
| | Are there extra planning provisions for fire protection? | | |
| 2. Site services | Are there opportunities to reduce the cost of site services with Canadian innovations? | | |
| | Are district heating systems in use, requiring decisions about how to service your units? | | |
| | If site services are supplied after housing construction, can you make provision for this in supplying your product, e.g., in preventing foundations from freezing? | | |
| 3. Home design | Do typical customers prefer "Canadian-style" design? | | |
| | Alternatively, would typical buyers like their house to look like others in the community? | | |
| | Are your product or system design and standard dimensions adapted to the metric system? | | |
| | Do potential customers want attached garages? | | |
| | Do they want garages in front, Canadian-style? | | |
| 4. Foundations | Can local companies pour foundations in forms? | | |
| | Can your company introduce innovations in foundation technology such as insulated forms? | | |
| 5. Structural elements | Will frame construction go up substantially faster than conventional local building methods? | | |
| | Do construction standards permit use of frame bearing walls? | | |
| | Does your target market demand a higher standard of lumber than is typically used in Canada? | | |
| | Do local builders require major training in frame technology to be able to do it well and quickly? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN PROMOTING THE "CANADIAN HOUSING SYSTEM" IN COUNTRIES USED TO SOLID MASONRY, POST-AND-BEAM, OR OTHER SYSTEMS (CONTINUED)

| ELEMENT | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 6. Exterior envelope, including windows and doors | Can you offer exterior finishes to suit the market? | | |
| | Can you meet the minimum insulation and air tightness standards called for in the target market? | | |
| | Are standards for staircases the same as in Canada? | | |
| | Are there security bars or grills on windows as a standard feature? | | |
| | Do you need to upgrade energy performance of walls, attic or windows to suit customer preferences? | | |
| | Is it necessary to take precautions with windows are to withstand moisture penetration from storms? | | |
| | Can you readily adapt window sizes and styles to customer preferences in your target market? | | |
| | Do you need to upgrade energy performance of windows by using low-emission glass? | | |
| | Do customers consider wooden windows to be preferable to vinyl? | | |
| 7. Roofing | Do standards permit use of asphalt roofing? | | |
| | Are trusses and other structural elements strong enough to support ceramic tile roofing? | | |
| | Can steel roofing be offered at a competitive price? | | |
| 8. Interior spaces, including doors | Can floor plans be customized to follow local designs? | | |
| | Does your space relate well to furniture size? | | |
| | Do you offer interior finishes to suit the market? | | |
| | Do you need to machine door jambs to accept sound insulating profile? | | |
| | Do you need to provide for passage of wiring through doors and/or walls? | | |

### QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN PROMOTING THE "CANADIAN HOUSING SYSTEM" IN COUNTRIES USED TO SOLID MASONRY, POST-AND-BEAM, OR OTHER SYSTEMS (CONTINUED)

| ELEMENT | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 9. Interior fixtures | Do cabinets typically come already installed?<br>Do customers prefer kitchens with built-in appliances?<br>Can you introduce innovations in kitchen technology as marketing features? | | |
| 10. Plumbing, etc. | Are minimum standards for plumbing different from those in Canada?<br>Can plastic piping systems be used in the target market? | | |
| 11. Heating, ventilation | Can you introduce forced-air heating systems where they are not used now?<br>Are customers most familiar and comfortable with hydronic heating systems?<br>Do you know if natural gas is of adequate quality for use with Canadian equipment?<br>Does a service network for forced-air heating equipment exist?<br>Is ventilation equipment usually put in finished areas of the dwelling, necessitating a finished appearance for units, in contrast with Canadian basement location? | | |
| 12. Electrical systems | Does your product adapt readily to use with 220 volt systems? | | |
| 13. Manufacturing equip. | Does your product adapt readily to use with the prevailing industrial power system?<br>Is there substantial retraining of workers involved to use your product?<br>How does your product mesh with other machinery and equipment from various other sources? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN PROMOTING THE "CANADIAN HOUSING SYSTEM" IN COUNTRIES USED TO SOLID MASONRY, POST-AND-BEAM, OR OTHER SYSTEMS (CONTINUED)

| ELEMENT | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 14. Construction equip. | Does your product adapt readily to use with 220 volt systems?<br>Is there substantial retraining of workers involved to use your product?<br>How does your product mesh with other machinery and equipment from various other sources? | | |
| 15. Power, hand tools | Does your product adapt readily to use with 220 volt systems?<br>Is there substantial retraining of workers involved to use your product?<br>How does your product mesh with other machinery and equipment from various other sources? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN SUPPLYING LOW-COST SITE SERVICES AND HOUSING SYSTEMS

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 1. Community planning | If there is no community planning, is it required for your system to work?<br>Can you introduce community planning as part of introducing your system?<br>Can your system produce sufficiently high densities to reduce per unit costs? | | |
| 2. Site services | Does a "site and services" approach make sense, i.e., leaving actual dwelling construction to households?<br>Can Canadian "healthy house" concepts, focused on autonomous services to dwellings, be marketed successfully?<br>Are building lots typically serviced in advance?<br>If site services are supplied after housing construction, can you make provision for this in supplying your system?<br>If site services are not provided at all, can this be factored into supply of your system? | | |
| 3. Home design | Does your system offer earthquake protection as an inherent design feature?<br>Does your system perform well in severe storms and in floods?<br>Can clever design make smaller spaces with fewer amenities functional and pleasant for inhabitants?<br>Does the target market have operable provisions for safety standards, consumer protection and quality assurance? | | |
| 4. Foundations | Are dwellings normally slab on grade?<br>Are there ways of providing a slab that is also more earthquake resistant? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN SUPPLYING LOW-COST SITE SERVICES AND HOUSING SYSTEMS (CONTINUED)

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 5. Structural elements | Can your system combine local materials with sophisticated engineering and production to create a strong, light, weather and pest-resistant superstructure?<br>Is qualified labour available locally for construction of building shells?<br>Do government officials based in the target country favour new housing technologies and products? | | |
| 6. Exterior envelope | Can your product or system help lower costs by using local materials for bearing walls?<br>If your system is being used in an earthquake zone, do doors open out, as they should?<br>Can offer adaptations such as different styles of windows be offered within an affordable package? | | |
| 7. Roofing | Does your product fit in with standard corrugated metal roofing?<br>Can your system combine indigenous materials with sophisticated engineering and production to create a strong, light, weather-resistant roof? | | |
| 8. Interior spaces | Are finishing materials readily available locally, at reasonable cost?<br>Does your system facilitate interior completion by occupants themselves?<br>Are interior surfaces of your system easy to keep clean and to repair? | | |
| 9. Interior fixtures | Are fixtures readily available locally, at reasonable cost?<br>Does your system facilitate interior completion of cabinetry, etc., by occupants themselves?<br>Are fixtures offered with your system easy to keep clean and to repair? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN SUPPLYING LOW-COST SITE SERVICES AND HOUSING SYSTEMS (CONTINUED)

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 10. Plumbing, etc. | Is interior plumbing included in your system?<br>Are plumbing components readily available locally, at reasonable cost?<br>Does your system facilitate plumbing work by occupants themselves?<br>Are plumbing systems offered easy to keep clear of deposits and to repair? | | |
| 11. Heating, ventilation | Is heating necessary in the climate of the market you are supplying?<br>If it is, can certain types of heating systems that reduce dwelling safety and durability be prohibited?<br>Do you supply a heating system as part of the package?<br>Are there opportunities to introduce new technologies to reduce costs and impacts on the environment? | | |
| 12. Electrical systems | Are electrical service and basic fixtures included with your system?<br>Are electrical components readily available locally, at reasonable cost?<br>Does your system facilitate safe electrical work by occupants themselves?<br>Are electrical systems offered easy to repair? | | |
| 13. Manufacturing equip. | Does your product adapt readily to use with the prevailing industrial power system?<br>Can your product run off of a variety of makeshift power sources as required?<br>Is there substantial training of workers involved to use your product?<br>How does your product mesh with other machinery and equipment from various other sources? | | |

## QUESTIONS POSED BY CANADIAN EXPORTERS AND INVESTORS IN SUPPLYING LOW-COST SITE SERVICES AND HOUSING SYSTEMS (CONTINUED)

| ELEMENT: | KEY QUESTIONS: | YES | NO |
|---|---|---|---|
| 14. Construction equip. | How readily can your product be serviced in the field with few technical skills or spare parts?<br>Can your product run off of a variety of makeshift power sources?<br>Is there substantial training of workers involved to use your product?<br>How does your product mesh with other machinery and equipment from various other sources? | | |
| 15. Power, hand tools | Does your product compare in price with "knock-off" products from developing and transitional economies?<br>How readily can your product be repaired in the field with few technical skills or spare parts?<br>Can your product run off of a variety of makeshift power sources?<br>Is there substantial training of workers involved to use your product?<br>How does your product mesh with tools and equipment from various other sources? | | |

## ANNEX "B": SELECT, ANNOTATED BIBLIOGRAPHY

### Introduction to Bibliography

The following bibliography offers a selective sample, both Canadian and International, of projects and theories of how designs and the process of design have been adapted to reflect local cultural and social conditions. The purpose of the bibliography, as in the report in general, is to raise the profile of the issue of adapting Canadian housing to international markets and to an appreciation for the range of work that has been carried out in each area.

The bibliography is broken down into three categories. The first category of Housing includes publications which incorporate different approaches to housing design issues, from northern housing to World Bank policies for improving housing for the urban poor. Within the supposition that housing cannot be viewed in isolation from its larger context, the second category, New Urbanism, includes examples of theories and practice in the field of modern urban design and planning practices. The final category, Adaptability In Design, provides a number of different examples of design principles for developed for different cultural needs, from the Chinese principles of Feng Shul to housing for the elderly.

These publications provides insights into both the strengths and weaknesses of work which has been carried out to date. As an overview, the theories and different approaches listed in 'Adaptability In Design' covers a wide spectrum, from housing the elderly to Chinese principles of design, which offers a good range of the considerations required for developing cultural considerations in designing housing for other markets. The list of publications under 'Urban Design', though it is still a developing field, is also an area where there is a considerable depth to the literature available. However, the housing projects listed under 'Adaptability in Design' are quite limited, other than in the areas of northern housing and international development, and within these areas, cultural adaptation itself is restricted, with the focus of work being placed on technical solutions to climatic issues or cost considerations. Within this area, there appears to be opportunity for a great deal of additional work to be carried out.

### HOUSING

Alliance-Jetro. *Seminar: Marketing Japan - A Technological Challenge*. Vancouver: Japan External Trade Organization and the Alliance of Manufacturers and Exporters of Canada, October 1996.

The seminar includes presentations by exporters of housing and wood products to Japan. Of particular note is the presentation by Mr. Scott Ando of Douglas Homes in Surrey, B.C. on 'An example of Canadian Housing built to the Japanese Market. Design and technical considerations are discussed.

Brand, Stewart. *How Buildings Learn: What Happens After They're Built*. Viking Press, 1994

Brand's starting point is the observation that most architects spend most of their time re-working or extending existing buildings, rather than creating new ones from scratch. Like people, buildings change with age, forced to adapt to the needs of current occupations. This examination of buildings that have adapted well, and some that haven't, calls for a dramatic rethinking in the way new buildings are designed, one that allows structures to grow and change easily with the environment.

Canada Mortgage and Housing Corporation. *Sharing Success in Native Housing*. Ottawa: Canada Mortgage and Housing Corporation, 1994.

Canada Mortgage and Housing Corporation Housing Awards for work in the area of Native Housing. Winning entries in the areas of Process and Management, Concept and Design, Planning and Regulation, Technology and Production, and Financing and Tenure.

Catholic University of Peru and the Technical University of Nova Scotia. *Investigations into Quincha Construction*. Halifax: Technical University of Nova Scotia, 1989.

Development & application of a modular building system for Villa El Salvador, Peru using a participatory design approach. Research for the project was carried out jointly by faculty and students from the Catholic University of Peru and the Technical University of Nova Scotia.

Edited Proceedings. *Japan's Changing Needs for Canadian Housing Products*. Vancouver: Canada-Japan Trade Council, 1995

The edited proceedings of a conference jointly sponsored by the Canada-Japan Trade Council and the David See-Chai Lam Centre of Simon Fraser University. Discussions of market trends and technical aspects of Canadian Housing products are discussed including example of how products have adapted for the Japanese Market

Jossa and Associates. *Planning and Architectural Considerations for Northern Housing*. Ottawa: Canada Mortgage and Housing Corporation, 1987.

The report provides guidelines dealing with significant issues to be considered in the planning and architectural design of northern housing.

Minimum Cost Housing Group. *Housing a Billion - Design Ideas for Rural China*. Montreal: McGill University, 1993.

This study explored new land use efficient planning and housing solutions for rural areas, and the production of a demonstration project for Fangtin, a prosperous market town located in the centre of the Sichuan Basin. The report describes the housing design which was developed for Fangtin and the planning and architectural concerns that guided the demonstration project. In addition it contains general background information on housing in China.

Perks, William and Van Vliet, David. *Assessment of Built Projects for Sustainable Communities*. Ottawa: Canada Mortgage and Housing Corporation, 1993.

The study establishes an extensive knowledge base on progress towards sustainable development being made in Scandinavian urban contexts and examines the potential for transferability to the Canadian context. Over 30 projects are visited and researched. The study includes a proposal for a concept schema and demonstration project in Calgary. The proposal outlines a new positioning for industry to meet the challenges of housing choice and sustainable development.

Richard, Pierre. *Design Options for Barrier Free and Adaptive Housing*. Ottawa: Canada Mortgage and Housing Corporation, 1996.

A housing type which can be easily adapted to the changing needs of its occupants. The book provides information on the characteristics of the Flex House as an example of a design for adaptive housing which can easily be integrated into building projects. Details on flexibility, increased security, improved functionality and ease of maintenance are provided.

World Bank. *Housing: Enabling Markets to Work. A World Bank Policy Paper*. Washington: World Bank, 1993.

The paper suggests major policy reforms for governments and the World Bank alike to improve housing for the urban poor. The report analyzes market forces that affect housing development. It describes policies that restrict the market and cripple housing supplies by discouraging investment and impractical housing strategies that raise costs and decrease quality. The program includes a detailed framework to help governments manage their housing sectors through policies and programs that not only benefit the poor but also includes them in decision making. It tells why the Bank should support innovative lending models and housing policies, and why the Bank should require governments to collect and analyze housing data more carefully.

## URBANISM

Barnett, Jonathan. *The Fractured Metropolis: Improving the New City, Restoring the Old City, Reshaping the Region*. Harper Collins, 1996

> Jonathan Barnett explores the ways of ameliorating the split between the `old city,' which used to be the center of things, and the `new city' on the metropolitan periphery. Barnett discusses a broad variety of recent plans and designs for controlling sprawl, improving urban centres and edge cities, and fitting new buildings in with old. A highly regarded overviews of how urban and metropolitan design issues are currently being dealt with.

Centre for Minimum Cost Housing. *How the Other Half Builds*. Montreal: McGill University, 1984.

> The report is the result of site surveys carried out in June 1984 in four slums in the city of Indore, India. Volume 1 is a study of the physical performance of informal housing in less developed countries including spatial requirements, low-cost construction materials, non conventional servicing and infrastructure technologies. Volume 2, using a quantitative approach, examines why plots acquire certain physical characteristics. Volume 3 consists of an experiment in which the findings of earlier studies were applied in search of new design methods for the production of user responsive housing for the poor.

Department of Urban and Regional Planning. *Planning Brazilian Communities: Viçosa - A City for People*. Halifax: Technical University of Nova Scotia, 1993.

> A development profile of Brazil with emphasis on Viçosa. The development potential for Viçosa, Brazil is explored using ideas in urban design and architecture for traditional communities.

Golany, Gideon. *Chinese Earth Sheltered Dwellings: Indigenous Lessons for Modern Urban Design*. Honolulu: University of Hawaii Press, 1992.

> The author examines the correlation between the physical and human environment in shaping earth sheltered dwellings. He offers extensive analysis of their advantages and disadvantages and concludes with a discussion of an innovative method of integrating the system of below ground space usage into modern urban design.

Katz, Peter and Scully, Vincent. *The New Urbanism: Toward an Architecture of Community*. Toronto: McGraw Hill, 1993.

The book discusses how the house, the street, the neighbourhood and the district fit into the modern urban fabric. The authors use numerous examples of communities in the U.S. to support the arguments of what has gone wrong and what is necessary in the design of the new urban fabric.

McGill School of Architecture. *Patterns of Living - Architectural Research in India*. Montreal: McGill University, 1994.

This report includes a series of case studies on architecture in India. Using homes, services and the village itself, the studies use drawings, photo essays and interviews as the research tools. The research examines the cultural traditions, rituals, and religions of the village, in addition to recording local construction methods, building materials, climatic variations, and environmental issues and their importance in the generation of design solutions.

Mohan, Rakesh. *Understanding the Developing Metropolis*. Oxford: Oxford University Press, 1994.

Third and final volume from the World Bank City Study analyzing the structure of Bogota and Cali, Columbia, involving the modelling different markets and the behavior of individuals, households, firms, and governments within these markets. Simple economic reasoning is used to understand the urban behavior that can determine a city's overall appearance and structure. The author underlines the importance of this understanding, which, he argues, could lead to the creation of more effective urban policies.

Serageldin, Ismail. *The Architecture of Empowerment: People, Shelter and Livable Cities*. England: Academy Editions, 1997.

Architect Ismail Serageldin details the similarities and differences between the cities of North America and Europe with those in the developing world, uncovering the dynamics of urban decay and unveiling the means of renewal. The Architecture Of Empowerment is a challenge to architects and others regarding the provision of shelter and infrastructure in collaboration with the community (from concept design through construction) integrated into a broader socio-economic strategy. Case studies illustrate the points raised and premises assumed.

Small Towns Research Unit. *Rebuilding the Idea of a Town: Proposals for Windsor, Nova Scotia*. Halifax: Technical University of Nova Scotia, 1993.

A project exploring new ideas in urban design, architecture and community dynamics. Prepared by the Small Towns Research Unit of the Technical University of Nova Scotia

World Bank. China: *Urban Land Management in an Emerging Market Economy. A World Bank Country Study*. Washington: World Bank, 1993.

This study explores the implications for every sector of the economy in the successful transition from state to private ownership of real property. This study endorses a strategy of complementary legal, fiscal, planning, and institutional reforms grounded in the ultimate objective of promoting land market transactions. The study suggests courses of action and outlining potential pitfalls with examples from cities in China and elsewhere.

## DESIGN

Alexander, Christopher et al. *A Pattern Language: Towns, Buildings, Construction*. Oxford: Oxford University Press, 1987

A Pattern Language presents a case for the influence of space, buildings, and landscape on human endeavors. Alexander and his contributing editors present a series of patterns that operate universally on the mood and activities of people using spaces. In providing a heightened appreciation for the influence of space on choices and activities, Alexander demystifies architecture itself, calling upon any reader to assume a role in the design process.

Fathy, Hassan. *Architecture for the Poor: An Experiment in Rural Egypt*. Chicago: University of Chicago Press, 1986.

A theory in architecture by a famous Egyptian architect Hassan Fathy. Fathy argues that you can build culturally appropriate buildings without using expensive materials. Architecture for the poor requires addressing the economic, social and aesthetic components of the construction and design of buildings. He practised his theory in Upper Egypt, Mexico, and many other countries.

Jones, Pettus; Pyatok and Jones. *Good Neighbors: Affordable Family Housing: Design for Living*. New York: McGraw-Hill, 1996.

An authoritative guide to modern affordable housing design. Based on the AIA (American Institute of Architects) Design for Housing initiative, the book provides architects, landscape architects, planners, developers, advocates, government officials, and policy makers with workable answers for the design of affordable, aesthetically pleasing housing.

Jossa and Associates. *Planning and Architectural Considerations for Northern Housing*. Ottawa: Canada Mortgage and Housing Corporation, 1987.

The report provides guidelines dealing with significant issues to be considered in the planning and architectural design of northern housing.

Khan, Hassan-Uddin. *Contemporary Asian Architects*. New York: Tashen Books, 1995

The author discussed the rapid transformation of Asian architecture and the result of the absorption of external influences (from the west) into the region's diverse cultures. The projects presented in the book provide examples of the synthesis of modern and traditional ideas in the work of some of the regions leading architects.

Nabokov, Peter and Easton, Robert. *Native American Architecture*. New York: Oxford University Press, 1989.

The book explores the siting, rituals and meanings of Native American architecture - from the Wigwam to the long house, providing background material necessary for the development of a culturally based approach to design. Construction materials layout and building symbolism are discussed.

Pin Matthews Architects. *Planning Study of Native Northern Communities*. Ottawa: Canada Mortgage and Housing Corporation, 1997.

The study is an evaluation of the success of existing planning and housing practice for Native communities in the western portion of the Northwest Territories, with an emphasis on the relationship between land/site planning, and social, cultural and environmental factors. The study includes community input, oral history, interviews, archival research, literature review and mapping of incremental development to date.

Rossbach, Sarah. *Interior Design With Feng Shui.* New York: Penguin Books, 1987.

A how-to manual to teach the practical applications of feng shui. The book acts as a guide to spatial arrangements, offering concepts, examples, and methods of achieving harmony in the interior design of buildings. It offers rules, resolutions, suggestions and hundreds of examples of design problems and cures.

Simon, Forster; Alcose, Brabes; and Ndubisi. *A Culturally Sensitive Approach to Planning and Design With Native Canadians.* Ottawa: Canada Mortgage and Housing Corporation, 1984.

A research project concerned with developing a planning process which supports the development of native communities. The study investigates different approaches to planning and design and proposes a culturally based approach to design for native communities.

Too, Lillian. *The Complete Illustrated Guide to Feng Shui: How to Apply the Secrets of Chinese Wisdom for Health, Wealth and Happiness.* Element Publishers, 1996.

Feng Shui ("wind and water") is the ancient Chinese metaphysical science or art of living in harmony with your environment in order to promote health, wealth, and happiness. The book is a good introduction to the principles, practices, and purposes of feng shui for the western reader provides the practical information needed to understand and apply feng shui principles to their own environments and lives. It also explains the roots of feng shui in ancient China, and contains colour artwork demonstrating the application of the principles.

Weal, Francis and Weal, Francesca. *Housing the Elderly: Options and Design.* New York: Nichols Publishing, 1988.

In designing housing, the authors have developed a design process which focuses on the specific requirements and needs of the elderly, . The book explores design ideas which range from the ergonomics of the kitchen to spatial considerations in planning a community.

## ANNEX "C": EXAMPLES OF CANADIAN EXPERTISE IN ADAPTATION

### Urban Keios

The partners of Urban Keios, Nickolas Semanyk and Jason Grant-Henley, graduated from Carleton University's School of Architecture in 1990 and began their careers by providing training in wood-frame construction techniques and the use of local materials in Russia. They went the region of Irkutsk in Siberia to help the Baikalsk Pulp and Paper Mill find a use for logs other than as wood pulp. Urban Keios has since delved into various post-modernist projects and takes much of its inspiration from the fashions of Germany's Bauhaus design school. Their design for the CBC television news studio in Ottawa is touted for its playfulness and use of cutting-edge artwork.

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bonk@sprint.ca

### Kingsley K. Lo Architect Inc.

Kingsley Lo is the president of this firm, which he established in 1976 following receipt of his architectural license and an apprenticeship in California, Washington State and Vancouver Canada. He has experience as an instructor in residential design and is the recipient of numerous architectural design awards. Mr. Lo's architectural firm provides a comprehensive range of architectural services including site analysis and planning, feasibility studies, architectural design, construction working drawings and specifications, tendering, inspections and construction contract administration. Mainly focused on residential projects and commercial projects, the firm's work includes multi-family housing, single-family custom homes, offices, retail, churches, restaurants and other development projects.

**Park Sanders Adam Vikse Architects Ltd.**

Park Sanders Adam Vikse Architects Ltd. is a Yellowknife based Northern consulting architecture and planning firm. Initially established as Park and Associates Ltd. in 1984, the current firm was formed in 1992 with a view to providing its clients with buildings that are readily and economically built and simple to maintain. The architectural team includes four principles who bring together a substantial history of design and production on many building types in diverse locations and climates. They have undertaken projects for the Government of the N.W.T., municipal authorities and numerous private clients. Recent project experience includes housing research and delivery in overseas markets.

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| | |
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| Email: | psavarch@ssimicro.com |

**MU Design Inc.**

MU Design Inc. provides design, technical and architectural services primarily for the Japanese housing and construction industry. Judith Johnston-Ueda and Minoru Ueda have brought their expertise in the areas of market analysis and Japanese architecture to a variety of projects. Among the services they offer are analysis and interpretation of Japanese building codes, conceptual and detailed design, preparation of workings and drawings, construction administration and supervision, advice on structural calculation requirements under the revised Japanese building code, and feasibility studies and market analysis for the Japanese housing and construction industry including regulatory and market trends. The company specializes in structural engineering research for seismic and severe wind conditions, and in design for traditional Japanese post and beam construction, 2x4 construction, steel, and reinforced concrete structures.

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## ANNEX "D" CANADIAN COMPANIES WITH EXPERIENCE IN ADAPTATION

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**All Span Building Systems Limited**

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**Beagle Construction Inc.**

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**Canadian International Core Housing (C.I.C.H.) Inc.**

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**Royal Canadian Homes Ltd.**

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**Unlimited Housing Corporation Intl. Ltd.**

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## ANNEX "E": STUDY METHODS AND INSTRUMENTS

### Scope

The research objectives of the project were:

- To develop a quantitative and qualitative presentation on the extent of "off-the- shelf" versus "adapted" offerings of industry at present, given the limits of available data;
- To develop a sector-by-sector picture of the feasibility of adaptation, based on considerations to be taken into account in each, and on specific case studies and success stories;
- To develop a ranked list of practical steps which can be taken by Canadian industry to adapt to foreign customer requirements and expectations.

Within all possible housing products, technologies and services, priority was to be given to adapting Canadian frame housing to meet requirements and expectations of those used to solid masonry construction, and to the export of whole housing systems, such as manufactured, panelized, pre-engineered, or similar types of housing, as well as to exports of associated technologies and services like architecture, project management, training, etc.

The basic research tool was a survey of current Canadian housing exporters operating in different sectors, conducted by mail, with follow-up by telephone to probe specific issues. In addition, the research team collected a range of case studies and sales materials used to market Canadian products, technologies and services abroad.
There were also interviews with knowledgeable experts in relation to generic information on specific products, technologies and services, including barriers or problems encountered. Data on current exports of products and services were secured from Statistics Canada, and considered item by item in relation to current and potential adaptability to foreign market requirements and expectations. Information came from publicly available materials with due consideration given to confidential and potentially sensitive commercial data. As much as possible, the research was linked to country priorities of the Canadian Housing Export Centre and of Canadian industry.

## Research Plan

### Literature Review

The study began with a brief survey of relevant literature on the topic of exporters in the housing industry. The study considered four main types of global housing markets:

- "High-Income Niche-Oriented Markets" for environmentally-friendly building products, equipment and systems; high-quality finishing materials for wood-frame and concrete construction.
- "High-Income Markets Dissatisfied with Traditional Technologies", demanding prefabricated components for more rapid erection of wood-frame dwellings; wood-frame, steel-frame and concrete building components made from new, more durable materials.
- "Middle-Income Growth Markets", calling for lumber, lumber-milling machines, cement block producing machines, other types of machinery and equipment to produce modest cost housing components from local resources.
- "Large Low-Income Markets Receiving Substantial Foreign Investment", needing light tools, equipment and components geared to low and modest-cost housing production.

### Industry Survey

The main research tool was a short survey of currently active Canadian housing exporters operating in different sectors, conducted by mail, with follow-up by telephone to probe specific issues. The sample of approximately 250-350 firms will be drawn from industry association membership lists, participants in international trade shows, the WINEXPORTS list and other sources.

Rather than a random sample, the aim was to secure a large "panel" of firms in different sectors, of different sizes, and operating within different regional markets, which have the most export experience in the field. The purpose was to maximize credibility of the results with industry, so that others not as far advanced in exporting will consider the practical options offered carefully.

The following topics were given priority in the survey:

- The company's export experience, types of products, technologies and services offered, and regional markets addressed around the globe;
- Extent to which the company already adapts or does not adapt its offerings to market requirements in other countries, with a set of options they can select;

- Current significant barriers faced by the company in international markets, with consumer acceptance and regulatory approval included;

- Comments on the relevancy and feasibility of adaptation from commercial, technical, design, and other perspectives.

### Content Analysis of Promotional Materials

Survey respondents were invited to send in examples of current efforts to adapt offerings to international markets, such as:

- designs geared to local tastes, recognition of cultural traditions in interiors of dwellings;

- modification of technologies to take into account consumer abilities;

- addition of fire protection or security provisions not typical in Canada.

The consultants assembled these into a checklist of ideas relevant to different products, technologies or services. In addition, the research team collected a range of materials now used to market Canadian products, technologies and services abroad, and determined through content analysis the amount of "profile" given to adaptations to local circumstances, versus the "Canadian" image of offerings.

### Interviews With Key Experts

The team will seek to validate the survey findings, conclusions, and recommendations though interviews with knowledgeable experts in relation to specific industry sectors, products, technologies and services. As a backdrop for these interviews, data on current exports of products and services will be secured from Statistics Canada, and considered item by item in relation to current and potential adaptability to foreign market requirements and expectations.

### Round Tables With Industry

Following assembly and analysis of survey and other research results, the team worked with the Canadian Housing Export Centre to call together a small group of experts from CMHC and key industry associations to react to the findings and conclusions, and to develop appropriate recommendations for industry flowing from the study.

# INDUSTRY SURVEY ON ADAPTING CANADIAN HOUSING TECHNOLOGIES TO INTERNATIONAL EXPORT MARKETS

**Survey Tally**

**Questions**

1. My company is:

| | |
|---|---|
| an experienced exporter | 38 |
| a recent exporter | 11 |
| just beginning to explore exporting | 4 |
| Total | 53 |

2. Our company sells:

| | |
|---|---|
| whole housing systems, e.g., prefabricated housing | 29 |
| major components such as kitchen cabinets, etc. | 19 |
| construction materials | 17 |
| services associated with housing | 16 |

3. In terms of markets, we focus on:

| | |
|---|---|
| the United States | 25 |
| Latin America | 13 |
| Western Europe | 25 |
| Central and Eastern Europe | 13 |
| Africa and the Middle East | 8 |
| Asia | 38 |
| Australasia | 5 |
| The whole world | 5 |

4. How important do you think it is to adapt what you sell to foreign market expectations, tastes, standards or other requirements that are different from those in North America?

| | |
|---|---|
| Very important | 31 |
| Somewhat important | 17 |
| Not required as they want what we have now | 5 |
| Depends on volume of future sales | 0 |
| Other: | 0 |

5. To what extent does your company already adapt its offerings to market requirements in other countries?

| | |
|---|---|
| To a great extent | 25 |
| Modest adaptations | 25 |
| No adaptations | 3 |

6. What adaptations are most common?

| | |
|---|---|
| Design | 40 |
| Colour | 6 |
| Finishing | 20 |
| Quality | 16 |
| Performance | 8 |
| Electrical system (e.g. 220 volts) | 15 |
| Standard dimensions | 26 |
| Added features not offered in North America | 17 |
| Fewer features than in North America | 11 |
| Language of product literature | 29 |

Other:

| | |
|---|---|
| Floor plans | 4 |
| Standard sizes | 2 |
| Language of product itself (design software) | 1 |

7. Could you describe in a few words how you adapt your product or service, or attach sample literature geared to foreign markets?

[Responses provided in main text]

8. What are the main barriers your company currently faces in entering overseas markets?

| | |
|---|---|
| Consumer acceptance | 20 |
| Regulatory approval | 18 |
| Lack of financing | 21 |
| Cost of shipping too high | 6 |
| Consumer incomes too low | 13 |
| Economic and political uncertainty | 23 |

Other:

| | |
|---|---|
| Trade and tariff barriers | 2 |
| Language issues | 1 |
| Acceptance by local trades people | 1 |
| Competition from other countries | 1 |
| Low prices | 1 |
| Undervaluation of good design by Canadian exporters | 1 |
| Lack of good business partners | 1 |
| Becoming known in foreign markets | 1 |
| Not applicable | 2 |

9. In addressing these barriers, how important do you think it will be to adapt or to continue to adapt what you export in the future?

| | |
|---|---|
| Will be very important | 36 |
| Will be somewhat important | 13 |
| Not required as they will want what we have now | 1 |
| Will depend on volume of future sales | 2 |

Other:

| | |
|---|---|
| Lack of commercial intelligence assistance | 1 |
| Will depend on to whom you are marketing | 1 |

10. Do you have any other comments on the relevancy and feasibility of adapting your products or services from commercial, technical, design, and other perspectives?

[Comments provided in main text]

11. I would like my company to be included in a networking directory on this subject:

| | |
|---|---|
| Yes | 47 |
| No | 5 |
| No response | 1 |